ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಮಹಿಳಾ ಚಿಂತನೆಗಳು

ಸಂಪುಟ-೧

ಗೌರವ ಸಂಪಾದಕರು

ಡಾ. ರವೀಶ ಹೆಚ್. ವಿ.

ಸಂಪಾದಕರು

ಡಾ. ಚೇತನಾ ಹೆಗಡೆ

ಅನಿತ ಕೆ. ವಿ.

ಮೌಂಟ್ ಕಾರ್ಮೆಲ್ ಕಾಲೇಜು, ಸ್ವಾಯತ್ತ, ಬೆಂಗಳೂರು

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ಸಂಶೋಧನ ಲೇಖನಗಳು

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Edited by : **Dr. Raveesh H.V.**
Dr. Chetana Hegde, Anitha K.V.

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ವಚನ ಚಳವಳಿಯಲ್ಲಿ ಪುಣ್ಯಸ್ತ್ರೀ ಎಂಬ ಪರಿಕಲ್ಪನೆ

– ಲೋಹಿತ್ ಪಿ.

12ನೆಯ ಶತಮಾನದ ಯುಗವೆಂದರೆ ಅದೊಂದು ಫಲ ತುಂಬಿದ ಮರವಿದ್ದಂತೆ. ನಾನಾ ವರ್ಗ, ವರ್ಣ, ಜಾತಿ, ಪ್ರದೇಶ, ಕಾಯಕಗಳಿಂದ ಅನೇಕ ಶರಣರು ಬಂದು ಸೇರಿ ಜಾತಿ, ಲಿಂಗ, ವರ್ಗ, ಬಡವ, ಬಲ್ಲಿದ ಭೇದಗಳನ್ನು ಅಳಿಸಿ ಹಾಕಿ ಸಮಾನತೆಯ ಹಂದರದ ಮೇಲೆ ಸಮಾಜವನ್ನು ಕಟ್ಟಲು ಅಣಿಯಾದರು. ಜನಸಾಮಾನ್ಯರನ್ನು ಮುಖ್ಯವಾಗಿ ಕೇಂದ್ರವಾಗಿಟ್ಟುಕೊಂಡು ಅವರಿಗೆ ನ್ಯಾಯಯುತವಾಗಿ ಸಿಗಬೇಕಾದ ಅನುಕೂಲತೆಗಳೂ, ಅವಕಾಶಗಳನ್ನು ಕಲ್ಪಿಸಲು ಮುಂದಾದರು. ಇಂಥ ಶರಣಯುಗ ಎಂಬ ಮಹಾಬೆಳಕಿನಲ್ಲಿ ನೂರಾರು ಮಹಿಳೆಯರು ಅದರಲ್ಲಿಯೂ ಕೆಳವರ್ಗದವರು, ಅನಕ್ಷರಸ್ಥರು ತಮ್ಮ ಆಲೋಚನೆಗಳನ್ನು ವಚನಗಳ ರೂಪ – ಶೈಲಿಯಲ್ಲಿ ಅಭಿವ್ಯಕ್ತಿಪಡಿಸಿದ್ದು ವಿಶೇಷ. ಸಮಾಜಕ್ಕೆ ಮಾರ್ಗದರ್ಶನ ಮಾಡಿದ್ದು, ಎಚ್ಚರಿಸಿದ್ದು ಮುಖ್ಯವಾಗಿದೆ. ಈ ನಿಟ್ಟಿನಲ್ಲಿ ಶಿವಶರಣರು ಹೆಣ್ಣನ್ನು ಗೌರವಿಸಿ ಸಮಾನ ಅವಕಾಶ ಮಾಡಿಕೊಟ್ಟಿದ್ದು. "ಹೆಣ್ಣು ಹೆಣ್ಣಲ್ಲ, ಹೆಣ್ಣು ರಕ್ಕಸಿ ಅಲ್ಲ, ಹೆಣ್ಣು ಸಾಕ್ಷಾತ್ ಕಪಿಲ ಸಿದ್ಧ ಮಲ್ಲಿಕಾರ್ಜುನ ನೋಡಾ" ಎಂದು ಹೆಣ್ಣನ್ನು ಶ್ರೇಷ್ಠತೆಯೆಡೆಗೆ ಕೊಂಡೊಯ್ದರು.

"ಗಂಡನ ಕೂಡ ಸಮಾಧಿಕೊಂಬ ಹೆಂಡಿರು ಅನಂತ, ಹೆಂಡಿರ ಕೂಡ ಸಮಾಧಿಯ ಕೊಂಬ ಗಂಡರುಂಟೆ ಲೋಕದೊಳ್?" ಎಂದು ಪ್ರಶ್ನಿಸಿದ್ದುಂಟು. ಇಂಥ ಸಮಾಜದಲ್ಲಿ ಮಹಿಳೆಗೆ ಶಿವಶರಣರು ನೀಡಿದ ಆದರ ಗೌರವಗಳು ಯಾವುದೇ ಕಾಲದಲ್ಲಿ ಯಾರೂ ನೀಡಿಲ್ಲವೆಂದೆ ಹೇಳಬಹುದು. ಮಹಿಳೆಯ ಅಂತಃಶಕ್ತಿ, ವೈಚಾರಿಕ ಸಾಮರ್ಥ್ಯವನ್ನು ಗ್ರಹಿಸಿ ಅವಳನ್ನು ಎಚ್ಚರಿಸಿದ ಶರಣರು ಅನುಭವ ಮಂಟಪದ ವೇದಿಕೆಯಲ್ಲಿ ಶೂನ್ಯ ಸಂಪಾದನೆಯ ಮಹಿಳಾ ಸಂವಾದ ಚರ್ಚೆಯ ಸನ್ನಿವೇಶಗಳನ್ನು ನೋಡಿದರೆ ಶರಣರ ದೃಷ್ಟಿಭಾವ, ವೈಶಾಲ್ಯ, ಗೌರವಿಸಿದ ರೀತಿ ನೀತಿ ಬಗ್ಗೆ ಸ್ಪಷ್ಟವಾಗುತ್ತದೆ. ಕೆಳವರ್ಗದ ಸ್ತ್ರೀಯು ಶರಣ ಪಥದಲ್ಲಿ ಆತ್ಮಸಾಕ್ಷಾತ್ಕಾರವನ್ನು ಮಾಡಿಕೊಂಡು, ಏಕದೇವೋಪಾಸನೆ, ವ್ರತನಿಷ್ಠೆ, ದಾಸೋಹ, ಕಾಯಕ, ನಡೆ ನುಡಿ ಒಂದಾದ ಪರಿ, ಈ ಮುಂತಾದವುಗಳನ್ನಿಟ್ಟುಕೊಂಡು ವಚನಗಳನ್ನು ಹೇಳಿದ್ದು ಅದ್ಭುತವೆನಿಸುತ್ತದೆ. ವಚನಕ್ರಾಂತಿಯಲ್ಲಿ ತಮ್ಮನ್ನು ತಾವೇ ತೊಡಗಿಸಿಕೊಂಡಿದ್ದ ಮಹಿಳೆಯರ ಸಂಖ್ಯೆ ಅಪಾರವಾಗಿದೆ. ಕೆಲವರ ವಚನಗಳು ಹೆಚ್ಚಿನ ಸಂಖ್ಯೆಯಲ್ಲಿ ಲಭಿಸಿದರೆ, ಇನ್ನೂ ಕೆಲವರದು ಕೇವಲ ಒಂದೇ ಒಂದು ವಚನ ಲಭ್ಯವಾಗಿದೆ.

ವಚನಕಾರ್ತಿಯರನ್ನು ಅಧ್ಯಯನ ಮಾಡುವಾಗ ಕೆಲ ಶರಣೆಯರ ಹೆಸರಿನ ಹಿಂದೆ 'ಪುಣ್ಯಸ್ತ್ರೀ' ಎಂದು ತುಂಬಾ ಗೌರವ ಅಭಿಮಾನದ ದ್ಯೋತಕವಾಗಿ ಸಂಬೋಧನೆ ಮಾಡಿದ್ದು ಕಂಡುಬರುತ್ತದೆ. ಇಂಥ ಪುಣ್ಯಸ್ತ್ರೀಯರು ಮುಖ್ಯವಾಗಿ ಕೆಳವರ್ಗ ಮತ್ತು ಕಾಯಕ ಜೀವಿ ಶರಣರ ಪತ್ನಿಯರು. ಶರಣರ ಹೆಸರಿನೊಂದಿಗೆ ಪುಣ್ಯಸ್ತ್ರೀ ಎಂಬ ವಿಶೇಷಣ ಬಳಸಿ ನಂತರ ಶರಣೆಯ ಹೆಸರನ್ನು ಬಳಲಾಗಿದೆ. ಇಂಥ ಪುಣ್ಯಸ್ತ್ರೀಯರಲ್ಲಿ ದಸರಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ವೀರಮ್ಮ, ಕಾಟಕೂಟಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ರೇಚವ್ವೆ, ಗಜೇಶ ಮಸಣಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ, ಉರಿಲಿಂಗಪೆದ್ದಿಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಕಾಳವ್ವೆ, ಸಿದ್ದಬುದ್ದಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಕಾಳವ್ವೆ, ಬತ್ತಲೇಶ್ವರನ ಪುಣ್ಯಸ್ತ್ರೀ ಗುಡ್ಡವ್ವೆ, ರೇವಣಸಿದ್ದಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ರೇಕಮ್ಮ, ಹಾದರಕಾಯಕದ ಮಾರಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಗಂಗಮ್ಮ, ಎಡಮಠದ ನಾಗಿದೇವಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಮಸಣಮ್ಮ, ಹಡಪದಪ್ಪಣ್ಣಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಲಿಂಗಮ್ಮ, ಗುಂಡಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಕೇತವ್ವೆ (ಕೇತಲದೇವಿ), ಕೊಂಡೆ ಮಂಚಣ್ಣಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಲಕ್ಷ್ಮಮ್ಮ, ರಾಯಸದ ಮಂಚಣ್ಣಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ರಾಯಮ್ಮ, ಬಾಚಿ ಕಾಯಕದ ಬಸವಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಕಾಳವ್ವೆ ಹೀಗೆ ಮೊದಲಾದವರು

ಕೆಳವರ್ಗದ ಮತ್ತು ಕೆಳಜಾತಿಯ ವಚನಕಾರ್ತಿಯರು ವೀರಶೈವ ತತ್ವಗಳನ್ನು ಸ್ಪಷ್ಟವಾಗಿ ಅರ್ಥಮಾಡಿಕೊಂಡು ಅದರಂತೆ ಬಾಳಿ ಬದುಕಿದರು. ಶರಣ ಬಸವಣ್ಣ ಇವರಿಗೆ ಮಾರ್ಗದರ್ಶಕನಾಗಿ ಇವನ ಪ್ರಭಾವಕ್ಕೆ ಒಳಗಾದ ಶರಣೆಯರು ತನ್ನರಿವೆ ತನಗೆ ಗುರು ಎಂಬ ಬಸವನ ಮೂಲಮಂತ್ರವನ್ನು ಜೀವಂತವಾಗಿಟ್ಟರು. ಅದಕ್ಕಾಗಿಯೇ ಆಮುಗೆ ರಾಯಮ್ಮ.

ನಾನೆ ಗುರುವಾದ ಬಳಿಕ ಗುರುವೆಂಬುದಿಲ್ಲ
ನಾನೆ ಲಿಂಗವಾದ ಬಳಿಕ ಲಿಂಗವೆಂಬುದಿಲ್ಲ
ನಾನೆ ಪ್ರಸಾದವಾದ ಬಳಿಕ ಪ್ರಸಾದವೆಂಬುದಿಲ್ಲ
ಅಮುಗೇಶ್ವರನೆಂಬ ಲಿಂಗವು ತಾನೆಯಾದ ಬಳಿಕ
ಲಿಂಗವನರಿದೆನೆಂಬ ಹಂಗಿನವನಲ್ಲ

ಇದಕ್ಕೆ ಪರ್ಯಾಯವಾಗಿ ದೇವರು, ಧರ್ಮ, ಲಿಂಗ, ಜಂಗಮ, ಗುರುವಿನ ಹೆಸರಿನಲ್ಲಿ ನಡೆದಿರಬಹುದಾದ ಶೋಷಣೆಯಿಂದ ಹೆಣ್ಣು ಮಕ್ಕಳು ಬಿಡಿಸಿಕೊಂಡು, ಸಾಮಾನ್ಯರು ಶೋಷಣೆಗೆ ಒಳಗಾಗಬಾರದೆಂಬ ಎಚ್ಚರಿಕೆಯ ಮಾತುಗಳನ್ನು ಈ ರೀತಿ ಹೇಳಿರಬಹುದು.[1] ಶರಣ ಗುಂಪಿಗೆ ಸೇರಿರುವ ಅನೇಕರನ್ನು ಹುರಿದುಂಬಿಸಿ, ಆತ್ಮಬಲವನ್ನು ತುಂಬಿ ಕೀಳರಿಮೆಯನ್ನು ಹೋಗಲಾಡಿಸಲಾಯಿತು. ದೇವರು, ಧರ್ಮಗಳ ಹೆಸರಿನಲ್ಲಿ ಸ್ತ್ರೀಯರ ಮೇಲೆ ಉಂಟಾಗುತ್ತಿದ್ದ ಶೋಷಣೆ, ಅನ್ಯಾಯ, ವಸ್ತುಸ್ಥಿತಿಯ ವಿರುದ್ಧ ಪ್ರತಿಭಟಿಸಲಾಯಿತು. ಈಗಾಗಲೇ ಅನ್ಯಾಯಕ್ಕೊಳಗಾದ ದೇಹ ಮತ್ತು ಮನಸ್ಸುಗಳ ಸ್ಥಿತಿಗೆ ಕಾಯಕದ ಪರಿಧಿಯಲ್ಲಿ ವಿಶಾಲತೆಯನ್ನು ಕಲ್ಪಿಸಿಕೊಟ್ಟು ಉದ್ಧರಿಸಿದ ಶ್ರೇಯ ಶಿವಶರಣರಿಗೆ ಸಂದಿದೆ. ಈ ದಿಸೆಯಲ್ಲಿ ಶೋಷಿತಗೊಂಡ ಹೆಣ್ಣಿನ ದೇಹ ಮತ್ತು ಆತ್ಮಕ್ಕೆ ಮರುಜನ್ಮ ನೀಡಿದವರು ಶಿವಶರಣರು. ಯಾವುದನ್ನು ಸಮಾಜ ಸೂಳೆಗಾರಿಕೆ, ವೇಶ್ಯಾವಾಟಿಕೆ, ದೇವದಾಸಿ ಎಂಬ ಕ್ರೂರಪದ್ಧತಿಗೆ ಹೆಣ್ಣುಗಳನ್ನು ಬಲಿಪಶು ಮಾಡಲಾಗುತ್ತಿತ್ತೋ ಅಂಥ ಸ್ತ್ರೀ ಸಮುದಾಯಕ್ಕೆ ಮರುಹುಟ್ಟನ್ನು ಕೊಟ್ಟು ಅವರನ್ನು ಉದ್ಧರಿಸಲಾಯಿತು.

ಸಮಾಜದ ಕೆಟ್ಟ ವ್ಯವಸ್ಥೆಗೆ ಬಲಿಯಾದ ಇಂಥ ಹೆಣ್ಣುಗಳನ್ನು ಸಾಮಾಜಿಕ ಜೀವನದಲ್ಲಿ ಸೇರಿಸಿಕೊಳ್ಳುವ, ಒಂದಾಗುವ ಆತ್ಮಸ್ಥೈರ್ಯವನ್ನು ಕಾಯಕದ ಪರಿಭಾಷೆಯಲ್ಲಿ ತುಂಬಿಕೊಟ್ಟವರು ಶಿವಶರಣರು. ಪುರುಷ ಸಮಾಜದ ದಬ್ಬಾಳಿಕೆಗೆ ಒಳಗಾದ ಸ್ತ್ರೀಯರನ್ನು ಮುಕ್ತಿ ಮಾಡಿದವರೆಂದರೆ ಪುರುಷರಾದ ಶಿವಶರಣರು. ಅಂಥ ಸ್ತ್ರೀಯರನ್ನು ಪುಣ್ಯಸ್ತ್ರೀ ಎಂದು ಹೆಸರಿಸಿ

ಗೌರವ, ಸ್ವಾಭಿಮಾನ ತಂದು ಕೊಟ್ಟವರೇ ಈ ಉದ್ಧಾರಕರಾದ ಶರಣರು.[1] ಇದು ಅಸಾಮಾನ್ಯವಾದ ಕೆಲಸ. ತನ್ನದೆಲ್ಲವನ್ನು ಕಳೆದುಕೊಂಡು ಹತಾಶರಾದವರಿಗೆ ಮರುಜೀವವನ್ನು ತುಂಬಿ ಸವಾಜಕ್ಕೆ ಮುಖಾಮುಖಿಯಾಗಿ ನಿಲ್ಲಲು ಅವಕಾಶ ಮಾಡಿಕೊಟ್ಟರು. ಈ ಸದವಕಾಶವನ್ನು ಮತ್ತು ತನ್ನೆಲ್ಲ ಸ್ವಾತಂತ್ರ್ಯವನ್ನು ಬಹಳ ಅರ್ಥವತ್ತಾಗಿ ಬಳಸಿಕೊಂಡು, ಬದುಕಿಗೆ ಹೊಸ ವ್ಯಾಖ್ಯಾನ ಬರೆದವರೇ ಪುಣ್ಯಸ್ತ್ರೀಯರು.

ಶಿವಶರಣರ ಪುಣ್ಯಸ್ತ್ರೀಯರು ಸತಿಪತಿಗಳೊಂದಾದ ಭಕ್ತಿಭಾವದಲ್ಲಿ ಹಿತವನ್ನು ಕಾಣುವ ಸಮಾನಶೀಲವಾದ ನಡತೆಯಲ್ಲಿ ಗೌರವಿಸಲ್ಪಟ್ಟವಳು. ವೈಚಾರಿಕ ಸತಿಯಾಗಿ, ದಾಂಪತ್ಯ ಜೀವನ ಸತ್ಯ ಶುದ್ಧವಾಗಿರಬೇಕು. ಗಂಡ ಹೆಂಡತಿ ಅಂತರಂಗ ಬಹಿರಂಗದಲ್ಲಿ ಒಂದೇ ಆಗಿ ಅವರು ಆಚಾರ ವಿಚಾರಗಳಲ್ಲಿ ತಾದ್ಯಾತ್ಮ ಹೊಂದಿ ಪರಸ್ಪರ ಪ್ರಶ್ನಿಸುವ, ತಿದ್ದುವ, ತೀಡುವ, ಒಬ್ಬರ ಸಂಶಯಗಳನ್ನು ಇನ್ನೊಬ್ಬರು ಪರಿಹರಿಸುವ ಹೀಗೆ ಎಲ್ಲ ದೃಷ್ಟಿಯಿಂದಲೂ ಗುಣಶೀಲತೆಯಿಂದ ಕೂಡಿ "ಕೂಟಕ್ಕೆ ಸತಿಪತಿ ಎಂಬ ನಾಮವಲ್ಲದೆ ಅರಿವಿಂಗೆ ಬೇರೊಂದೊಡಲುಂಟೆ?" ಎಂಬ ಸಮತಾಭಾವನೆಯ ಬದುಕು ಇವರದಾಯಿತು.

ಪುಣ್ಯಸ್ತ್ರೀಯರು ಹೆಚ್ಚಾಗಿ ವ್ರತಾಚಾರದ ನಿಷ್ಠೆಯ ಕುರಿತು ಮಾತನಾಡಿದರು ಮತ್ತು ಅದನ್ನೇ ತಮ್ಮ ಜೀವನದುದ್ದಕ್ಕೂ ಪಾಲಿಸಿದರು. ಆಚಾರ ಪ್ರಧಾನವಾದ ಶರಣ ಧರ್ಮದಲ್ಲಿ ನೇಮಶೀಲ, ಚಾರಿತ್ರ್ಯ ಎಂಬುದು ಮಾತಿನ ಸೂತಕವಾಗದೆ ನೈತಿಕ ಜವಾಬ್ದಾರಿಯಾಗಿತ್ತು. ಗುಂಡಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ದೇತಲದೇವಿಯ ವೈಚಾರಿಕತೆ ಈ ಕೆಳಗಿನ ವಚನದಲ್ಲಿ ಕಾಣಬಹುದು.

ಹದ ಮಣ್ಣಲ್ಲದೆ ಮಡಕೆಯಾಗಲಾರದು
ವ್ರತಹೀನನ ಬೆರೆಯಲಾಗದು
ಬೆರೆದಡೆ ನರಕ ತಪ್ಪದು
ನಾನೊಲ್ಲೆ ಬಲ್ಲೆನಾಗಿ ಕುಂಭೇಶ್ವರಾ[3]

ಒಟ್ಟಾರೆ ಶರಣರು ಪುಣ್ಯಸ್ತ್ರೀಯರಿಗೆ ಕೊಟ್ಟ ಗೌರವ ಮರ್ಯಾದೆಗಳ ಪರಿಣಾಮವಾಗಿ ಅವರಿಂದ ವಿನೂತನವಾದ ಕೊಡುಗೆ ವೀರಶೈವ ಧರ್ಮಕ್ಕೆ ಲಭಿಸಿತು.[4] ಪುಣ್ಯಸ್ತ್ರೀಯರ ಕಾಯಕ ಪರಿಕಲ್ಪನೆ, ವ್ರತನಿಷ್ಠೆ, ಏಕದೇವೋಪಾಸನೆ, ಸತ್ಯನಿಷ್ಠೆ, ಆತ್ಮಸ್ಥೈರ್ಯ, ಗುರು ಲಿಂಗ ಜಂಗಮ ಈ ಮೊದಲಾದವುಗಳು ಮೆಚ್ಚುವಂಥವುಗಳಾಗಿವೆ. ಪ್ರಸ್ತುತ ಕಾಲಕ್ಕಂತೂ

ಇವರ ಬದುಕು ಮತ್ತು ವಚನಗಳು ದಾರಿದೀಪಗಳಾಗಿವೆ. ಸೋತು ನೊಂದು ಹೋದ ಬದುಕನ್ನು ಪುನಃ ಕಟ್ಟಿಕೊಳ್ಳಲು ಇವು ಪ್ರೇರೇಪಿಸುತ್ತವೆ. ಜೀವನ ಪ್ರೀತಿಯನ್ನು ಕಲಿಸಿಕೊಡುತ್ತವೆ.

ಅನುಬಂಧ
ಪುಣ್ಯಸ್ತ್ರೀಯರು
ದಸರಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಏರಮ್ಮ
ಕಾಟಕೂಟಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ರೇಚವ್ವೆ
ಗಜೇಶ ಮಸಣಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ
ಉರಿಲಿಂಗಪೆದ್ದಿಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಕಾಳವ್ವೆ
ಸಿದ್ದಬುದ್ದಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಕಾಳವ್ವೆ
ಬತಲೇಶವರನ ಪುಣ್ಯಸ್ತ್ರೀ ಗುಡ್ಡವ್ವೆ
ರೇವಣಸಿದ್ದಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ರೇಕಮ್ಮ
ಹಾದರಕಾಯಕದ ಮಾರಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಗಂಗಮ್ಮ
ಎಡಮಠದ ನಾದಿದೇವಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಮಸಣಮ್ಮ
ಹಡಪದಪ್ಪಣ್ಣಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಲಿಂಗಮ್ಮ
ಗುಂಡಯ್ಯಗಳ ಪುಣ್ಣ್ಯಸ್ತ್ರೀ ಕೇತವ್ವೆ (ಕೇತಲದೇವಿ)
ಕೊಂಡೆ ಮಂಚಣ್ಣಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಲಕ್ಷ್ಮಮ್ಮ
ರಾಯಸದ ಮಂಚಣ್ಣಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ರಾಯಮ್ಮ
ಬಾಚಿ ಕಾಯಕದ ಬಸವಯ್ಯಗಳ ಪುಣ್ಯಸ್ತ್ರೀ ಕಾಳವ್ವೆ

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ಮೌಂಟ್ ಕಾರ್ಮೆಲ್ ಕಾಲೇಜು, ಸ್ವಾಯತ್ತ

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ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಮಹಿಳಾ ಚಿಂತನೆಗಳು

ಅಂತರಾಷ್ಟ್ರೀಯ ವಿಚಾರ ಸಂಕಿರಣ 2024

ಪ್ರಮಾಣಪತ್ರ

ಶ್ರೀ/ಶ್ರೀಮತಿ/ಡಾ./ಪ್ರೊ ಲೋಹಿತ್. ಟಿ ಇವರು ದಿನಾಂಕ ೦೬ ಮಾರ್ಚ್ ೨೦೨೪ರಂದು ನಡೆದ ಕನ್ನಡ ಸಾಹಿತ್ಯ : ಮಹಿಳಾ ಚಿಂತನೆಗಳು ಎಂಬ ಅಂತರಾಷ್ಟ್ರೀಯ ವಿಚಾರ ಸಂಕಿರಣದಲ್ಲಿ ಸಕ್ರಿಯವಾಗಿ ಭಾಗವಹಿಸಿ, ಪ್ರಬಂಧ ಮಂಡನೆ ಮಾಡಿರುತ್ತಾರೆ. ಪ್ರಬಂಧ ಮಂಡನೆ ವಿಷಯ : ಮಹಿಳಾ ಚಿಕ್ಕುಬುಕ್ಕಿಯಲ್ಲಿ ಪೌರ್ಣಿಮೆ ಎಂಬ ವಿಶೇಷ ಕಲ್ಪನೆ

ಡಾ. ಜಾರ್ಜ್ ಲೇಖಾ
ಪ್ರಾಂಶುಪಾಲರು

ಡಾ. ರವೀಶ ಹೆಚ್. ವಿ.
ಮುಖ್ಯಸ್ಥರು - ಕನ್ನಡ ವಿಭಾಗ

ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು ಜಿಲ್ಲಾ ಸಮಿತಿ, ಶಿವಮೊಗ್ಗ

ಕುವೆಂಪು ವಿ.ವಿ. ಕನ್ನಡ ಅಧ್ಯಾಪಕರ ವೇದಿಕೆ, ಶಿವಮೊಗ್ಗ

ಕಡೆಕೊಪ್ಪಲ ಪ್ರತಿಷ್ಠಾನ ರಿ., ಶಿವಮೊಗ್ಗ.

ಕನ್ನಡ ವಿಭಾಗ, ಸಹ್ಯಾದ್ರಿ ವಿಜ್ಞಾನ ಕಾಲೇಜು, ಶಿವಮೊಗ್ಗ

ಜಾನಪದ ದಿಕ್ಕು-ದೆಸೆ

ಒಂದು ದಿನದ ರಾಜ್ಯ ಮಟ್ಟದ ಅಧ್ಯಯನ ಶಿಬಿರ

ಅಭಿನಂದನಾ ಪತ್ರ

ಶ್ರೀಮತಿ/ಶ್ರೀ ಯೋಗಿಕಾಂತ್. ವಿ. ಇವರು

ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು ನೇತೃತ್ವದಲ್ಲಿ ೨೦೨೪ ಮೇ ೨೮ ರಂದು ಏರ್ಪಡಿಸಿದ್ದ 'ಜಾನಪದ ದಿಕ್ಕು-ದೆಸೆ' ಒಂದು ದಿನದ ರಾಜ್ಯ ಮಟ್ಟದ ಅಧ್ಯಯನ ಶಿಬಿರದಲ್ಲಿ ಭಾಗವಹಿಸಿದ್ದಾರೆಂದು ದೃಢೀಕರಿಸಲಾಗಿದೆ.

ಡಿ. ಮಂಜುನಾಥ
ಅಧ್ಯಕ್ಷರು
ಕರ್ನಾಟಕ ಜಾನಪದ ಪರಿಷತ್ತು, ಶಿವಮೊಗ್ಗ

ಪ್ರೊ. ಸಜಿತಾ ಬನ್ನಾಡಿ
ಅಧ್ಯಕ್ಷರು,
ಕುವೆಂಪು ವಿ.ವಿ. ಕನ್ನಡ ಅಧ್ಯಾಪಕರ ವೇದಿಕೆ, ಶಿವಮೊಗ್ಗ

ಪ್ರೊ. ಎನ್. ರಾಜೇಶ್ವರಿ
ಪ್ರಿನ್ಸಿಪಾಲರು,
ಸಹ್ಯಾದ್ರಿ ವಿಜ್ಞಾನ ಕಾಲೇಜು, ಶಿವಮೊಗ್ಗ

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INTELLECTURAL PROPERTY RIGHTS IN DIGITAL ERA: ISSUES AND CHALLENGES

Editors

Dr. S. MariGowda

Prof. Geetha N

Dr. Govardhan P K

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National Conference Proceedings
"INTELLECTUAL PROPERTY RIGHTS IN DIGITAL ERA: ISSUES AND CHALLENGES"
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THE INTELLECTUAL PROPERTY RIGHTS IN INDIA: A STUDY

[1]RUDRESHA C E and [2]Dr. CHANDRASHEKARAPPA U

[1]Assistant Professor & HoD of Commerce DVS College of Arts, Science & Commerce, Shimoga
[2]Assistant Professor Department of Commerce DVS College of Arts, Science & Commerce, Shimoga

Email: rcecomedu@gmail.com

ABSTRACT: *The intellectual property rights (IPR) are intangible in nature and gives exclusive rights to inventor or creator for their valuable invention or creation. In present scenario of globalization, IPR is the focal point in global trade practices and livelihood across the world. These rights boost the innovative environment by giving recognition and economic benefits to creator or inventor whereas the lack of IPR awareness and its ineffective implementation may hamper the economic, technical and societal developments of nation. Hence dissemination of IPR knowledge and its appropriate implementation is utmost requirement for any nation. The present paper highlights various terms of IPR such as patents, trademarks, industrial designs, geographic indications, copyright, etc. and also studying about the challenges and opportunities of IPR at present scenario.*

Keywords: *Intellectual Property Rights, Globalization, Inventor, Economic, Technical*

1 INTRODUCTION

Intellectual property (IP) pertains to any original creation of the human intellect such as artistic, literary, technical, or scientific creation. Intellectual property rights (IPR) refers to the legal rights given to the inventor or creator to protect his invention or creation for a certain period of time. These legal rights confer an exclusive right to the inventor/creator or his assignee to fully utilize his invention/creation for a given period of time. It is very well settled that IP play a vital role in the modern economy. It has also been conclusively established that the intellectual labor associated with the innovation should be given due importance so that public good emanates from it. There has been a quantum jump in research and development (R&D) costs with an associated jump in investments required for putting a new technology in the market place. The stakes of the developers of technology have become very high, and hence, the need to protect the knowledge from unlawful use has become expedient, at least for a period, that would ensure recovery of the R&D and other associated costs and adequate profits for continuous investments in R&D. IPR is a strong tool, to protect investments, time, money, effort invested by the inventor/creator of an IP, since it grants the inventor/creator an exclusive right for a certain period of time for use of his invention/creation. Thus IPR, in this way aids the economic development of a country by promoting healthy competition and encouraging industrial development and economic growth.

2 OBJECTIVES AND METHODOLOGY

The primary objective of this paper is to understand the intellectual property rights, different classification of intellectual property rights in India and significance of intellectual property rights at present scenario. The

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necessary data for the study are collected from secondary sources such as journals, working papers, articles, published books, websites, etc.,

3 HISTORY OF INTELLECTUAL PROPERTY RIGHTS

Intellectual property can be defined creative work of human intellect. Though there is no official record of the origin of IP, it is believed that a rudimentary form of IP was being practiced around 500 Before the Common Era (BCE) in Sybaris, a state of Greece. The natives of Sybaris were granted a year's protection for using their intellect to create any new improvement in luxury. A practical and pragmatic approach to IP governance started taking shape in medieval Europe.
In 1623, Britain passed an Intellectual Property Legislation which entitled guilds (associations of artisans or merchants) to create innovations and bring them to market for trade purposes. However, this legislation brought a lot of resentment amongst the public and thus was replaced by the 'Statute of Monopolies', which gave the rights to the original creator/inventor for 14 years. Legislation the 'Statute of Anne ', was passed by the British parliament in 1710.
This legislation aimed at strengthening copyrights by providing rights to the authors for recreation and distribution of their work. The work could also be renewed for another 14 years. By the end of the 18th century and the beginning of the 19th century, almost every country started laying down IP legislation to protect their novel inventions and creations.

3.1 Global History of IPR

The mention of intellectual property rights in an implied manner was mentioned in the universal declaration of human rights (1948). Article 27 mentioned the right to "share in scientific advancements and its benefits"
Paris Convention for Protection of Individual Property (1883) took place in response to failure of an exhibition organized in the year 1873, as the participants hesitated to participation as they were insecure about their intellectual property rights.
This convention laid various guidelines for states to accept for fair and just environment of inventions. It was mostly aimed at Patent. Complimentary to the Paris Convention, took place the Patent Cooperation Treaty (1970), which established international regulations regarding patent.

Berne Convention for The Protection of Literary & Artistic Works (1886) took regarding the subject matter of Copyright. It is the oldest treaty on copyright. This convention was aimed at protecting the rights of authors for their literary and artistic works.

Universal Copyright Convention (1952) was an alternative made by UNESCO for states that didn't agree with the Berne Convention but still wanted to be a part of multilateral copyright treaty.
Madrid Agreement Concerning the International Registration of Marks (1891) introduced a system for obtaining a bundle of Trademark registration in separate jurisdictions. This treaty along with the 1989 Protocol forms the international system of recognition of marks.
Rome Convention (1961) was the first time where neighbouring rights were dealt with.
Agreement on Trade-Related Aspects of Intellectual Property (TRIPS) came into force on 1st January 1995. It includes most of Berne Convention Rules. It was formed and administered by the World Trade Organization (WTO).

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3.2 History of IPR in India

Ramayana was written centuries ago. However, the holy book still holds its value in the current modern world. Maharishi Valmiki is still accredited for his work. Lord Vishwakarma is applauded for his architectural works even today. That is how recognition of makers of something intellectual lays the foundation of confidence in the upcoming generations.
For the first time in 1856, the Indian Patents Act came into force which introduced IPR in India during British reign. The World Intellectual Property Organisation (WIPO) was established on July 14, 1967. India became a member of WIPO in 1975. The treaty requires India's compliance with the international rules and regulations surrounding IPR.

3.3 Laws Relating to Intellectual Rights in India

The following statutes have been enacted with the view to bring in regulations regarding intellectual property rights in India.

a. Patents Act, 1970(most recent being the Patent Amendment Act, 2005)
b. Trade Mark Act, 1999 (most recent being the amendment by the finance Act of 2017)
c. The Designs Act, 2000
d. The Geographical Indications of Goods (Registration and Protection) Act, 1999
e. The Copyright Act, 1957 (most recent being amended in the year 1999)
f. The Protection of Plant Varieties and Farmers Right Act, 2001
g. The Semi-Conductor Integrated Circuits Layout Design Act, 200

4 SCOPE OF INTELLECTUAL PROPERTY

The scope of IP rights is broad; two classification modes are used to determine whether IP is copyright or Industrial Property. Industrial properties include patents or inventions, trademarks, trade names, biodiversity, plant breeding rights and other commercial interests. A patent gives its holder the exclusive right to use the Intellectual Property for the purposes of making money from the invention.
An invention is itself a new creation, process, machine or manufacture. Having copyright does not give you the exclusive right to an idea, but it protects the expression of ideas that are different from a patent. Copyright covers many fields, from art and literature to scientific works and software.
Even music and audio-visual works are covered by copyright laws. The duration of copyright protection exists 60 years after the death of the creator. In other words, an author's book is copyrighted for his entire life and then 60 years after his death. Unlike patent laws, there is no requirement of the administrative process in copyright laws.

4.1 Classification of Intellectual Property Rights

The subject of intellectual property is very broad. There are many different forms of rights that together make up intellectual property. IP can be basically divided into two categories, that is, industrial Property and intellectual property. Traditionally, many IPRs were collectively known as industrial assets.
It mainly consisted of patents, trademarks, and designs. Now, the protection of industrial property extends to utility models, service marks, trade names, passes, signs of source or origin, including geographical indications, and the suppression of unfair competition. It can be said that the term 'industrial property" is the predecessor of 'intellectual property".

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a) **Copyright:** Copyright law deals with the protection and exploitation of the expression of ideas in a tangible form. Copyright has evolved over many centuries with respect to changing ideas about creativity and new means of communication and media. In the modern world, the law of copyright provides not only a legal framework for the protection of the traditional beneficiaries of copyright, the individual writer, composer or artist, but also the publication required for the creation of work by major cultural industries, film; Broadcast and recording industry; And computer and software industries.

It resides in literary, dramatic, musical and artistic works in "original' cinematic films, and in sound recordings set in a concrete medium. To be protected as the copyright, the idea must be expressed in original form. Copyright acknowledges both the economic and moral rights of the owner. The right to copyright is, by the principle of fair use, a privilege for others, without the copyright owner's permission to use copyrighted material. By the application of the doctrine of fair use, the law of copyright balances private and public interests.

b) **Patent:** Patent law recognizes the exclusive right of a patent holder to derive commercial benefits from his invention. A patent is a special right granted to the owner of an invention to the manufacture, use, and market the invention, provided that the invention meets certain conditions laid down in law. Exclusive right means that no person can manufacture, use, or market an invention without the consent of the patent holder. This exclusive right to patent is for a limited time only.
To qualify for patent protection, an invention must fall within the scope of the patentable subject and satisfy the three statutory requirements of innovation, inventive step, and industrial application. As long as the patent applicant is the first to invent the claimed invention, the novelty and necessity are by and large satisfied. Novelty can be inferred by prior publication or prior use. Mere discovery 'can't be considered as an invention. Patents are not allowed for any idea or principle.

The purpose of patent law is to encourage scientific research, new technology, and industrial progress. The economic value of patent information is that it provides technical information to the industry that can be used for commercial purposes. If there is no protection, then there may be enough incentive to take a free ride at another person's investment. This ability of free-riding reduces the incentive to invent something new because the inventor may not feel motivated to invent due to lack of incentives.

c) **Trademark:** A trademark is a badge of origin. It is a specific sign used to make the source of goods and services public in relation to goods and services and to distinguish goods and services from other entities. This establishes a link between the proprietor and the product. It portrays the nature and quality of a product. The essential function of a trademark is to indicate the origin of the goods to which it is attached or in relation to which it is used. It identifies the product, guarantees quality and helps advertise the product. The trademark is also the objective symbol of goodwill that a business has created.

Any sign or any combination thereof, capable of distinguishing the goods or services of another undertaking, is capable of creating a trademark. It can be a combination of a name, word, phrase, logo, symbol, design, image, shape, colour, personal name, letter, number, figurative element and colour, as well as any combination representing a graph. Trademark registration may be indefinitely renewable.

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d) **Geographical indication:** It is a name or sign used on certain products which corresponds to a geographic location or origin of the product, the use of geographical location may act as a certification that the product possesses certain qualities as per the traditional method. Darjeeling tea and basmati rice are a common example of geographical indication. The relationship between objects and place becomes so well known that any reference to that place is reminiscent of goods originating there and vice versa.

It performs three functions. First, they identify the goods as origin of a particular region or that region or locality; Secondly, they suggest to consumers that goods come from a region where a given quality, reputation, or other characteristics of the goods are essentially attributed to their geographic origin, and third, they promote the goods of producers of a particular region. They suggest the consumer that the goods come from this area where a given quality, reputation or other characteristics of goods are essentially attributable to the geographic region.

It is necessary that the product obtains its qualities and reputation from that place. Since those properties depend on the geographic location of production, a specific link exists between the products and the place of origin. Geographical Indications are protected under the Geographical Indication of Goods (Registration and Protection) Act, 1999.

e) **Industrial design:** It is one of the forms of IPR that protects the visual design of the object which is not purely utilized. It consists of the creation of features of shape, configuration, pattern, ornamentation or composition of lines or colours applied to any article in two or three-dimensional form or combination of one or more features. Design protection deals with the outer appearance of an article, including decoration, lines, colours, shape, texture and materials. It may consist of three-dimensional features such as colours, shapes and shape of an article or two-dimensional features such as shapes or surface textures or other combinations.

f) **Plant variety:** A new variety of plant breeder is protected by the State. To be eligible for plant diversity protection, diversity must be novel, distinct and similar to existing varieties and its essential characteristics under the Plant Protection and Protection Act, 2001 should be uniform and stable. A plant breeder is given a license or special right to do the following in relation to different types of promotional material:

- ❖ Produce and reproduce the material
- ❖ Condition the material for the purpose of propagation
- ❖ Offer material for sale
- ❖ Sell the materials
- ❖ Export the materials
- ❖ Import the materials
- ❖ The stock of goods for the above purposes

Typically, countries are protecting new plant varieties through the Sui Genis system. The general purpose of conservation is to encourage those who intend to manufacture, finance, or exploit such products to serve their purpose, particularly where they otherwise do not work at all.

The enactment of the Protection of Plant Varieties and 'Farmers' Rights Act 2001 is an outcome of the India's obligation which arose from article 27(3)(b) of the TRIPs Agreement of 2001 which obliges

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members to protect plant varieties either by patents or by effective sui generic system or by any combination thereof India declined to protect plant varieties by a sui generis law, i.e. the Plant Varieties Act.

Significance of Intellectual Property Rights:

Intellectual Property Rights are important because of the following reasons:

a) **Boost Business Growth:** There are chances of business ideas/strategies being stolen by rival businesses in order to capture the firm's market share and decelerate business growth. Therefore, small and medium enterprises need to protect their exclusive goods and services because losing out on market share and potential customers can be very harmful to such firms in the beginning stages. Thus, IPRs help such firms by preserving their ideas.

b) **Easing the Marketing Process:** Intellectual property is an essential tool for creating an identity for a business. It helps a firm in distinguishing its own products and services in the market from those of others; thus, encouraging easier reach to the target customers, thereby making the whole marketing process very seamless.

c) **Safeguarding Unique Ideas:** Many a time people try to copy the creation of others for their own commercial profit. It becomes essential to protect such ideas and creations from rival parties to ensure exclusivity and uniqueness in one's own creation.

d) **Raising Funds:** Any Intellectual Property Right owner is free to monetise and commercialize his Intellectual Property assets through sale, licensing and use as a guarantee for debt financing. Intellectual Property Rights can also be used to raise funds through public borrowings, loans, and government subsidies.

e) **Enhancing Export Opportunities:** A business with registered IPRs can use its brands and designs to market its goods and services in other markets too. It means that a business with registered IPRs can tap into franchising agreements with foreign companies or export their patented products.

5 CONCLUSION

Intellectual property rights are monopoly rights that grant temporary privileges to their holders for the exclusive exploitation of income rights from cultural expressions and inventions. There must be good reasons for a society to grant such privileges to some of its individuals, and so proponents of these rights provide us with three widely accepted justifications to protect today's inter-global intellectual property rights. It is clear that the management of IP and IPR is a multi-disciplinary task and calls for many different functions and strategies that need to be aligned with national laws and international treaties and practices. It is no longer fully driven from the national point of view.

Different forms of IPR demand different treatment, handling, planning and strategies, and individuals' engagement with different domain knowledge such as science, engineering, medicine, law, finance, marketing, and economics. Intellectual property rights (IPR) have social, economic, technical and political implications.Leading rapid technology, globalization and fierce competition to protect against infringement of innovations with the help of IPRs such as patents, trademarks, service marks, industrial design registrations, copyrights and trade secrets. But there is still a violation of intellectual property rights. The

government is also taking measures to stop them. There are laws regarding the prevention of infringement of intellectual property rights.

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Certificate

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COMPARATIVE ANALYSIS OF VISCERAL FAT IN MALE HANDBALL PLAYERS OF KUVEMPU UNIVERSITY

Sachin K.*

Abstract

The objective of the investigation was to evaluate the level of visceral fat among handball players at Kuvempu University who were between the ages of 18 and 25. By analysing the levels of visceral fat in this age group, this study seeks to close the gap and offer important insights for improving performance and health. Visceral fat, sometimes referred to as abdominal fat or central obesity, has been found to pose a serious risk for several illnesses, including metabolic disorders, cardiovascular diseases, and poor sports performance. Athletes in the physically demanding and energetic sport of handball must maintain an ideal body composition for improved performance and injury prevention. On the comparative examination of visceral fat measurement, specifically among handball players, there is, however, little research.

Keywords: Visceral fat, Handball, Players, Kuvempu University

Introduction

The dramatic rise in obesity incidence and the associated health issues in recent years underline the necessity for an effective body composition assessment in athletes. Although body mass index and skinfold thickness tests are routinely used, they cannot distinguish between visceral fat, which is metabolically active and poses greater health risks, and subcutaneous fat. A precise measurement of visceral fat is necessary for maintaining handball players' health and performance because of the strenuous training and physical demands placed on them.

Being overweight or obese can place additional strain on the muscles, limiting one's ability to move swiftly and powerfully. Additionally, having more body fat may result in less muscular mass and less muscle power. It is important to keep in mind that individual differences in body composition and how it affects performance exist, and that other factors such as training, genetics, and general fitness level all play a significant role. To properly assess an athlete's performance in team sports like football, a holistic approach that considers various aspects of physical fitness in addition to body mass and body fat is essential. Optimising body composition is a focus for training and diet as well as a key performance factor in team handball. In this context, a common instrument for monitoring body mass status is the body mass index. Body mass index groups people into four bodyweight groups based on health considerations that is below weight, regular weight, overweight, and over obesity.

The variety of weightiness loss techniques makes the insignificance of this problem even above deceptive. The frequency of overweight has not able intensified recently, triggering deep health dangers, and affecting worldwide health. Several weight loss methods and involvements have been established to focus this matter, varying from eating habits and training schedules to therapeutic medications and medical processes. It is fundamental to identify the intricate features of weight restraint, which integrates such type of factors like heredity, life outcomes, nutrition, exercises, quality of body movements, and psychological variables. Furthermore, community, and ecological circumstances may influence on weight of the human being.

CHARECTERISATION TECHNIQUES

Abstract

Characterization techniques help in understanding the properties of materials at a fundamental level. This knowledge is critical in fields like materials science, where the properties of substances dictate their behavior and potential applications. Researchers use characterization techniques to study new materials, compounds, and structures, facilitating innovation and the development of new technologies, medicines, materials, and products.

Industries use characterization to optimize manufacturing processes, improve efficiency, and enhance the performance of materials in various applications. Characterization contributes to advancing scientific knowledge by unveiling the structures, properties, and behaviours of substances at various levels, leading to discoveries that deepen our understanding of the natural world.

In essence, scientific characterization techniques are indispensable tools that drive innovation, ensure quality, aid in problem-solving, and expand our understanding of materials and their applications across a wide range of scientific disciplines and industries.

This chapter emphasis on the detailed overview on Physio chemical properties study of materials in ten different sections. First section briefs about the need of characterization, second and third sections briefs about single crystal XRD and powder XRD studies respectively. chapter highlights the using X-ray diffractions. The fourth section focus on the Fourier transform infrared studies and in the fifth section discussion of UV Visible spectroscopy. The sixth section enlightens about the thermogravimetric analysis and

Authors

M R Hareeshkumar
Department of Physics
DVS College of Arts and Science
Constituent College of Kuvempu University
Shivamogga, Karnataka, India.
hari.melgiri@gmail.com

M R Jagadeesh
Department of Physics
Bapuji Institute of Technology
Affiliated to VTU Belagavi
Davangere, Karnataka, India.

followed by seventh section with FESEM and edax studies discussion. The dielectric studies and the micro hardness studies were discussed in the eighth and nine sections. Finally, the important tool to evaluate the nonlinear optical properties of the materials i.e., Kurtz powder method is discussed in detail in the last secttion.

Keywords: In essence, scientific characterization techniques are indispensable tools that drive innovation, ensure quality.

I. INTRODUCTION

In materials science, characterization denotes external methods to probe into a material's internal structure and properties. Actual materials testing or analysis may be used to characterize a material. Techniques are used to magnify the specimen, imagine its internal structure, and learn about the distribution of elements within the specimen and their interactions, for example, in certain study forms. A type of microscope is typically used for magnification and internal visualization.

The connection of physical and chemical properties with structural characteristics, manufacturing, and preparation conditions is crucial to creating novel products and enhancing prevailing products. A thorough understanding of a product's material properties under manufacturing or application conditions is essential for its performance. Another significant aspect of efficient product development and quality complications depends on macroscopic as well as microscopic material properties.

This chapter delivers an overview of the experimental techniques used to characterize the grown crystals in this study. Diffractometers are used to analyze the structure and crystalline nature. Fourier transform infrared (FTIR) spectroscopy identifies the different functional groups of the crystal. A TG-DTA thermal analyzer and UV-visible spectrometer were used to examine the thermal and linear optical properties.SEM and EDAX have been used to investigate the surface morphology and elements in the material. The frequency-dependent dielectric parameters were observed. Vicker's microhardness tester is utilized to assess microhardness and different mechanical parameters. Finally, The SHG efficiency of the grown crystals was detected by the Kurtz powder

II. CHARACTERIZATION AND EXPERIMENTAL TECHNIQUES

X – Ray Diffraction

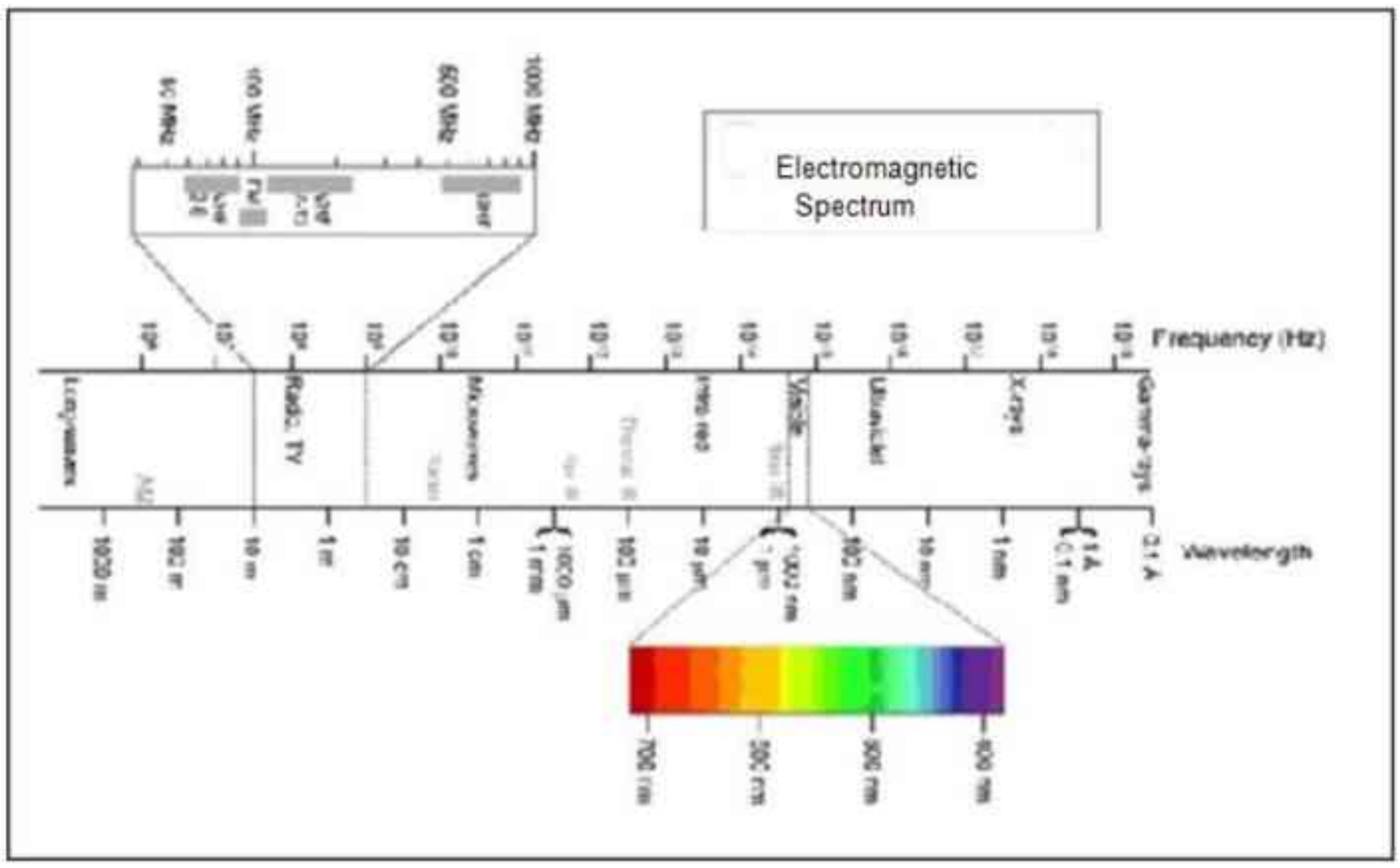


Figure 1: Electromagnetic Spectrum

X-ray diffraction is a non-destructive method for examining the structural aspects of crystalline solids, such as metals, electronic and geological materials, and organics. Figure 1 shows that the X-rays are part of the shorter wavelength of the electromagnetic spectrum (about $1A^0$). There are categories of X-ray diffraction methods: Single crystal and powder methods.

III. SINGLE CRYSTAL X-RAY DIFFRACTION ANALYSIS

This Characterization assists in determining the atomic positioning within the test sample. The several confines associated with molecular architecture is determined using this method. Figure 2 shows an instrument that comprises an X-ray production tube, a sample mounting space, and revealers.

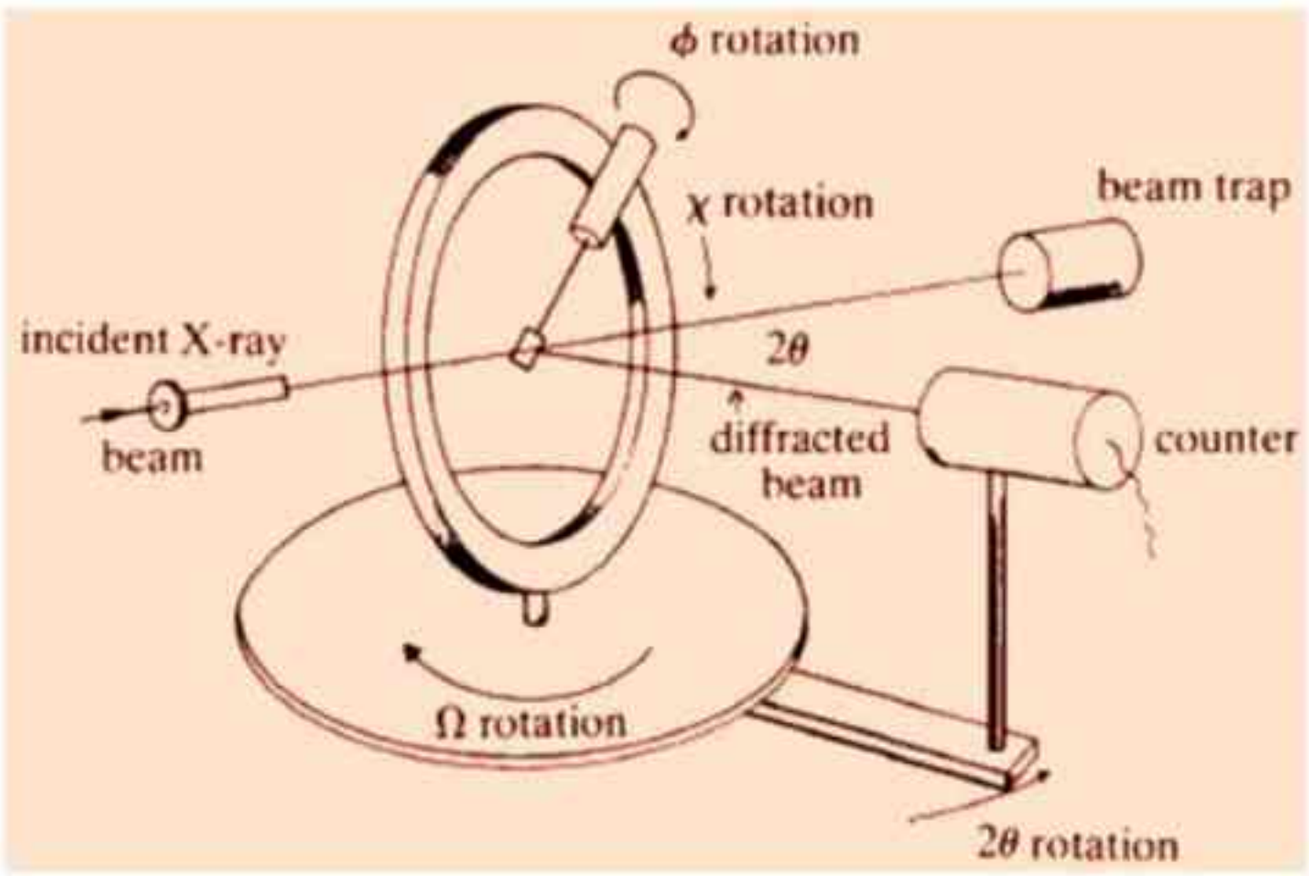


Figure 2: Geometry of Single-Crystal X-ray Diffractometer

A monochromatic fine X-ray beam are scattered on the sample so that the angle of planes of scattering satisfies Bragg's law well known equation which results, in constructive interference. Further, the detector collects scattered means diffracted X-rays of a specific orientation. Charge-coupled devices (CCD) convert X-ray photons into electrical signals in most modern single-crystal XRD diffractometer.

The sensor is attached to a device that keeps track of the signal's count rate. The present study determined crystal parameters using a Bruker Smart Apex Duo single-crystal X-ray diffractometer, shown in figure 3.Using the lattice parameters as well as space group, the single XRD analysis predicts the crystal systems and their symmetric conditions.

Figure 3: Bruker Smart Apex Duo Single Crystal X-Ray Diffractometer

1. **Powder X-Ray Diffraction Analysis:** Powder x-ray diffraction analysis helps understand the properties of all types of materials. X-rays beam is incident on a specimen and is dispersed X-ray by planes satisfying the Bragg's equation. The orientation of the crystal lattice concerning the incident beam determines the magnitude of diffracted light. Thus, the constructive interference circumstances are analogous to the law of reflection.

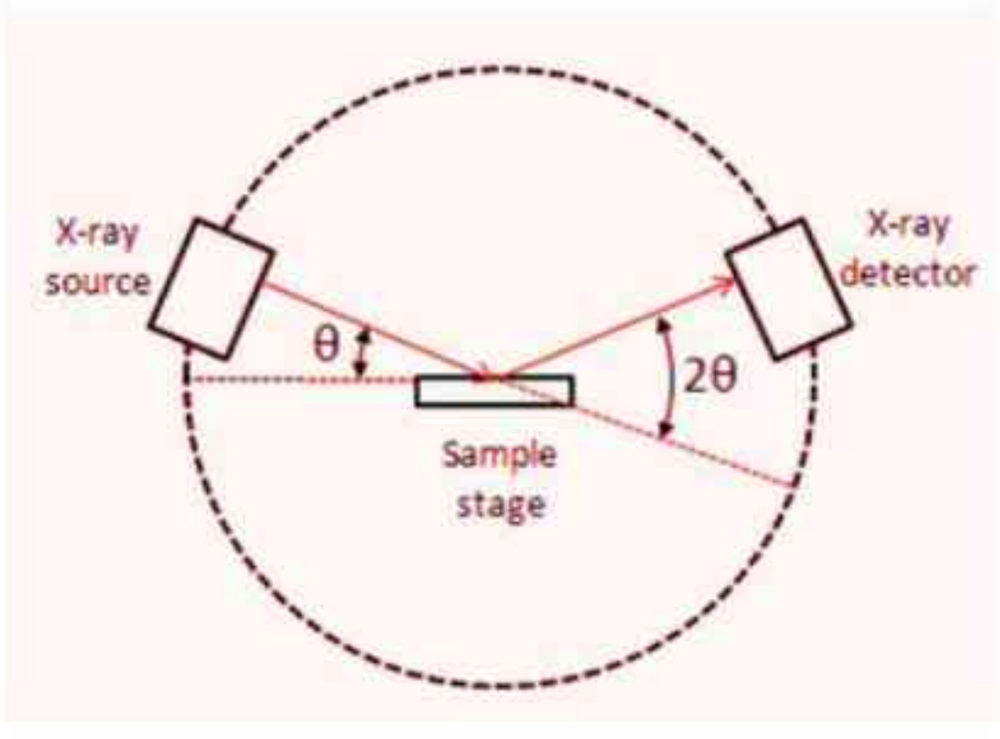


Figure 4: Schematic Diagram of a Powder X-ray Diffractometer

The instrument comprises of powdered content, goniometer and detector. The powdered sample provides possible orientations; the goniometer offers various incidence directions, and the sensor reads the strength of the resulting beam. Characteristically, the obtained results are graphed as a series of peaks with percentage intensity (on the Y-axis) and goniometer angle (on the X-axis). Here, the monochromator operate gives the detector a specific wavelength. Figure 4 graph will show which different phases are present in the study.

Figure 5 shows the X-ray study of the present work employing a Bruker AXS D8 progressive PXRD diffractometer with Cu-K radiations (=1.5406). The data was collected

inthe 2θ range at a 2° per minute continuous scan speed.

Figure 5: Bruker AXS D8 Progressive PXRD Diffractometer

In XRD studies helps in finding the definite arrangement of atoms within the crystalline specimen for having definite peak. In general, the shift in the peak during the XRD analysis is due to linkage between host and doped particle, due to change in the size of the host particle and change in the binding energy and due to change in mechanical properties. Doping other atoms into a structure will lead to both peak shifts and changes in intensity.

The peak shifts occur because of the difference in size of the atoms, and cause the repeat distances in the crystal structure to expand or contract depending on whether the doped atom is larger or smaller than the host atom. The change in intensity occurs because the electron density of the doped atom is different than that of the surrounding atoms, and can make some peaks more intense and other peaks less intense. However, the degree of these changes depends on the concentration of the doping atom.

IV. FOURIER TRANSFORM INFRARED SPECTROSCOPY

It's a popular analytical method for determining the composition and structure of organic and inorganic substances. FTIR includes the target sample absorbing various infrared radiations and producing an IR spectrum that helps identify the substances. Figure 1.6 shows the spectral range of FTIR study for any crystal.

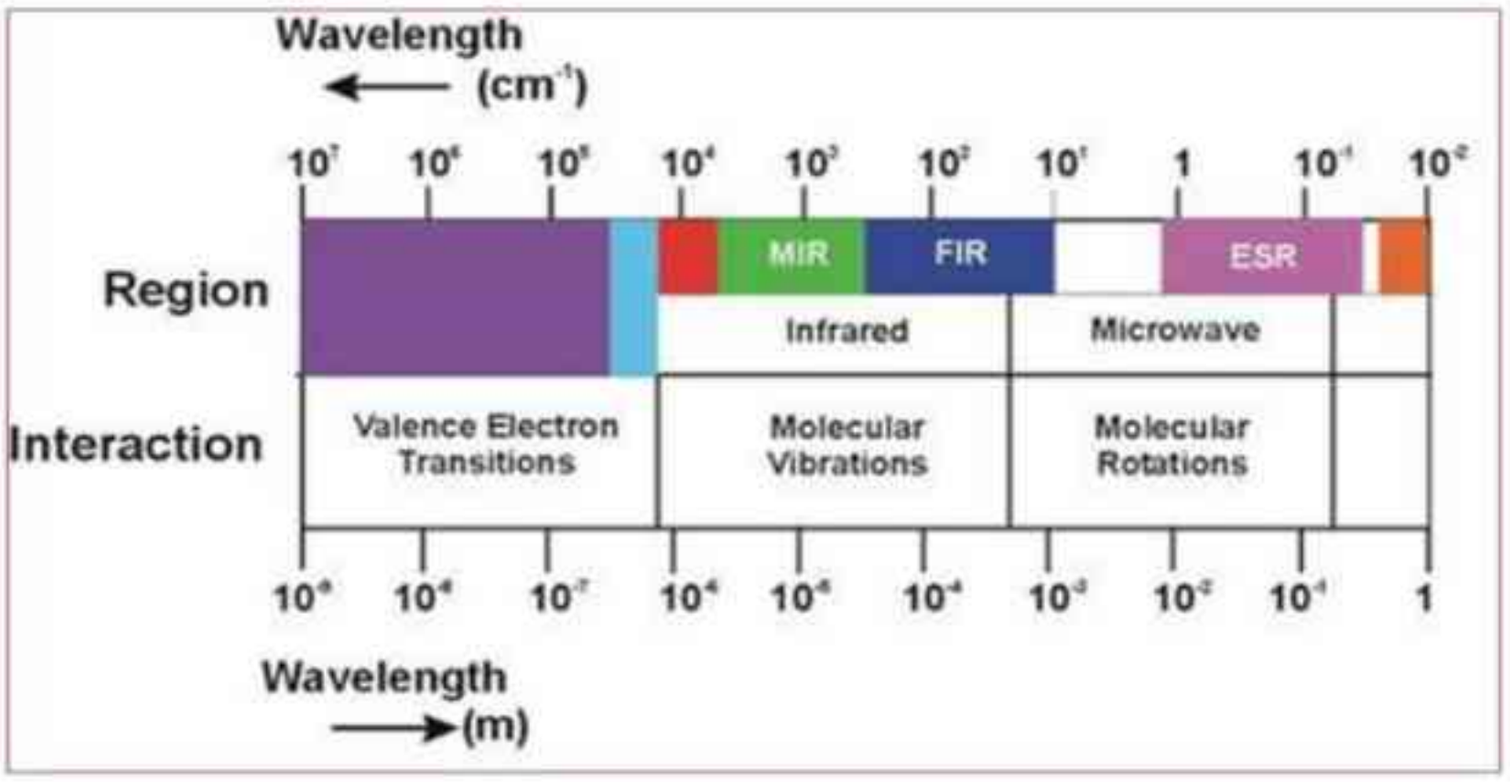


Figure 6: Spectral Ranges for FTIR study

Energy absorption occurs at resonance among the wavelengths of incident radiation and the molecule's vibrational frequency. Due to this, the molecules de-excite by releasing the absorbed energy, resulting in distinct IR peaks. Hence, the circumstances of the molecules in the testing sample are represented by these absorption bands. The infrared region is divided into three areas: near-infrared, mid-infrared, and far-infrared, and the functional groups attached to these regions are analyzed.

The characteristic wave number range of the near-infrared region is 12800-4000 cm^{-1}.Solid and liquid samples were analyzedusing diffusive reflectance or radiation absorption in this range. Wave numbers in the 4000- 200 cm^{-1} range are used in the mid-infrared studies. Composite gaseous, organic complexes, liquid or solid blends, pure solid or liquid samples, and atmospheric samples can all be studied using absorption, reflectance, or emission in this area.

Conversely, quantization of vibrational motion of molecules is taken into account. Hence, to excite a molecule from one vibrational frequency to another, it must be absorbed IR radiation of specific energy. Stretching and bending are the most basic vibrational movements in molecules caused by IR radiation.

These stretching modes may be symmetrical or asymmetrical. Bending vibrations includes scissoring, rocking, twisting, and wagging. Figure 1.7 depicts the various groups bending vibrations.

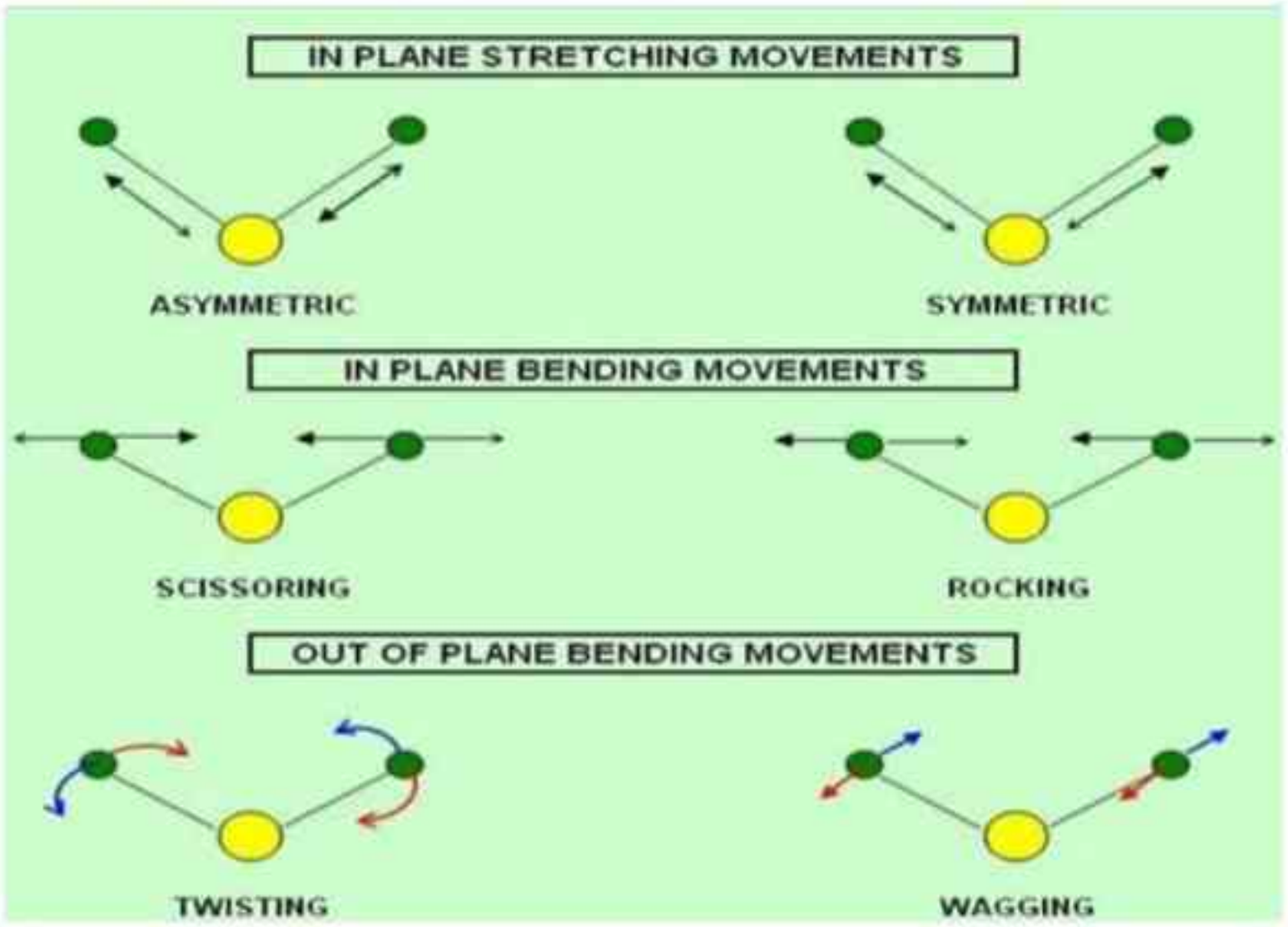


Figure 7: Vibrational Modes of Stretching and Bending in a Molecule

The inter-atomic range will shift continuously along the axis of the bond binding two atoms due to the stretching oscillations. In the case of organic crystals, FTIR assists in the identification of different functional groups as well as the confirmation of phase formation. The infrared spectrum region between 4000 and 1500 cm^{-1} is described as the functional group range. The peaks in this range represent the presence of functional groups in the molecule, while the region below 1500 cm^{-1} is known as the traits footprint region. Figure 8 signifies the distinctive Infrared region bands.

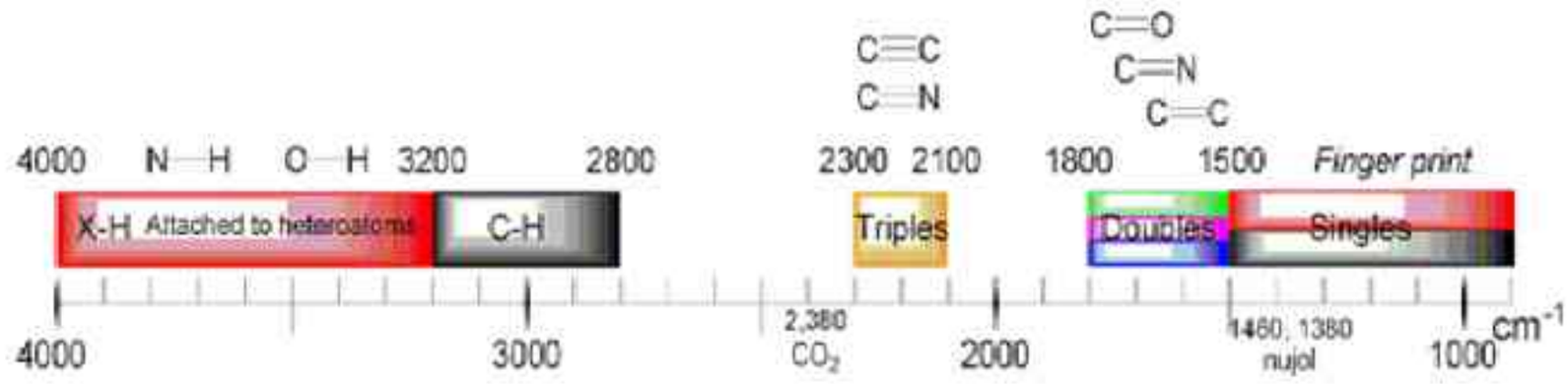


Figure 8: Graphical Depictions of IR Bands

Figure 9 shows the source, monochromator and detector that make up an IR spectrometer. The source is chosen to be stable and has an uninterrupted emission across the whole IR spectrum. Even though these radiations are continuous, the samples can only absorb particular frequencies. The Nernst glowers, which can reach 2200 K and a Glabor, which can reach 1500 K, are the most common sources. The strength of radiant energy depends on the source temperature. A bright energy source that allows for the isolation of narrow frequency bands is provided.

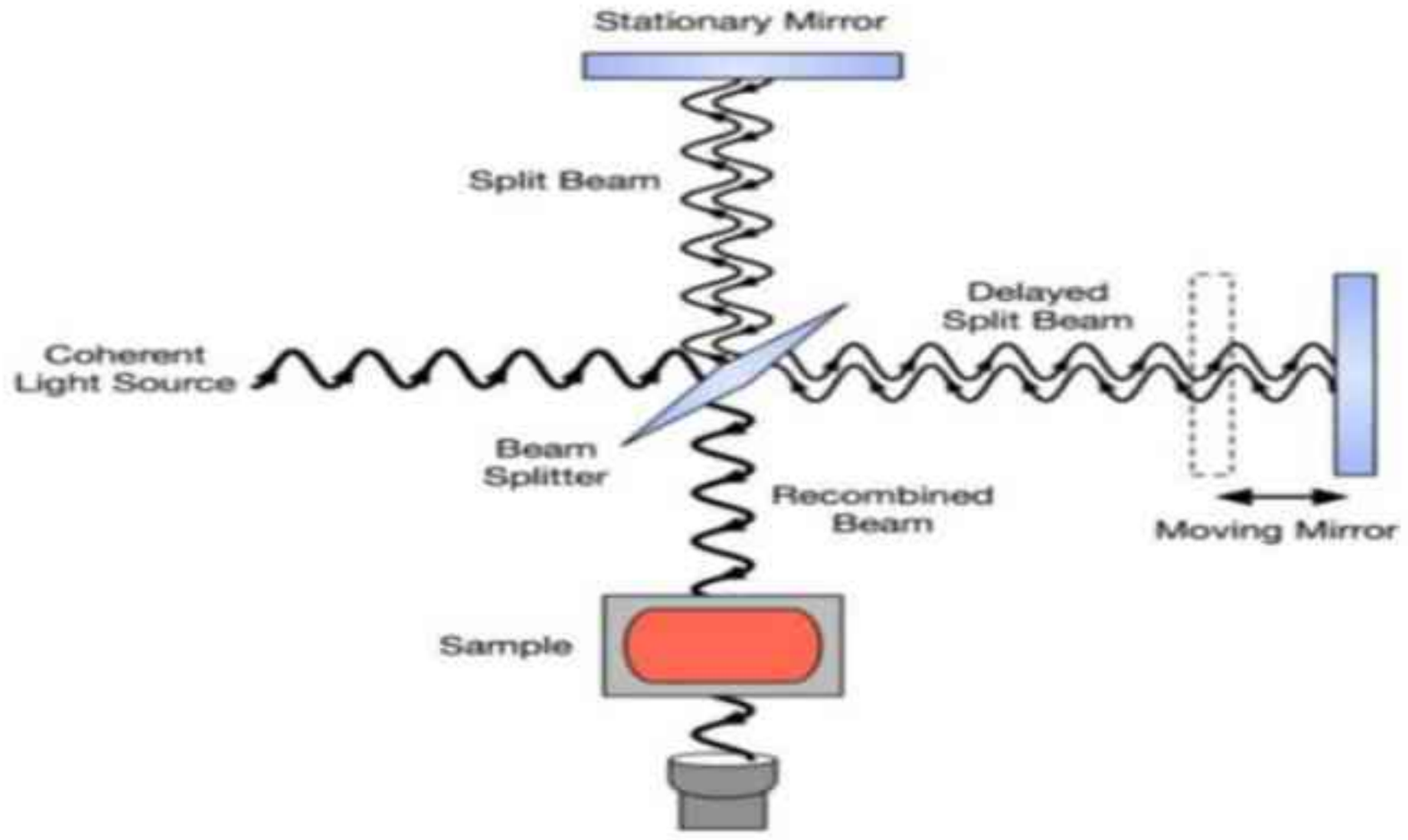


Figure 9: Typical FTIR Interferometer

The dispersive IR instruments consist of a monochromator(prism or diffraction grating)that absorbs the specific frequency of radiation. The detector is the set-up for the end part ofthe experiment to detect the radiations. The essential purpose of these infrared detectors is to calculate the source's IR energy and convert it radiation energy to electrical energy. Generally, IR region's radiant power is small, resulting in a low signal at the detector. A preamplifier is attached to the detector helps in amplifying the signals. The most widely used are Golay cells, Semiconductor detectors, and Pyroelectric detectors. FTIR spectrometers have a variety of benefits compared to dispersive IR spectrometers. Furthermore, the FTIR technique is utilized to examine gases, liquids, and solids in a short amount of time with minimal sample standardization. This analysis used a Bruker IFS FTIR spectrometer, as exposed in figure10.

Figure 10: Bruker IFS FTIR Spectrometer

V. ULTRAVIOLET-VISIBLE SPECTROSCOPY

UV-visible spectroscopy studies the optical absorption of a variety of materials quantitatively. The optical transparency of NLO crystals is one of the most significant

parameters for determining material capability for device fabrication. The UV region's energy is appropriate to cause electronic transitions and excitations at the levels of rotational, vibrational, and electronic energy called electronic spectroscopy. The electromagnetic spectrum's ultraviolet (UV) region ranges from 100-400 nm. Since the air molecules absorb radiation in this region, the vacuum UV (below 200nm) is only accessible with special vacuum equipment. There are three types of valence electrons in organic crystals that alter the electronic energy of the molecule by subsequent absorption of UV radiation, and they are

- **σ- Electrons:** These are electrons connected with saturated bonds, also known as σ bonds.

  Since the energy needed to excite electrons in σ bonds is substantially larger than that provided by UV light. bonds do not absorb UV light.
- π- **Electrons:** Unsaturated hydrocarbons, such as aromatic compositions, contain these electrons.
- **n- Electrons:** The bonding between the atoms in the particles is not affected by these electrons. UV radiation is absorbed by organic compounds containing nitrogen, oxygen,or halogen.

A transfer of valence electrons occurs as a complex molecule absorbs UV radiation. During these transitions, An electron moves up to the next higher orbital from an occupied orbital. The Probable modifications are $\sigma \rightarrow \sigma^*$, $n \rightarrow \sigma^*$, $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$. Among these, $n \rightarrow \pi^*$modulation is forbidden when the selecting rule is employed. Figure 1.11 depicts a schematic representation of excitation energies.

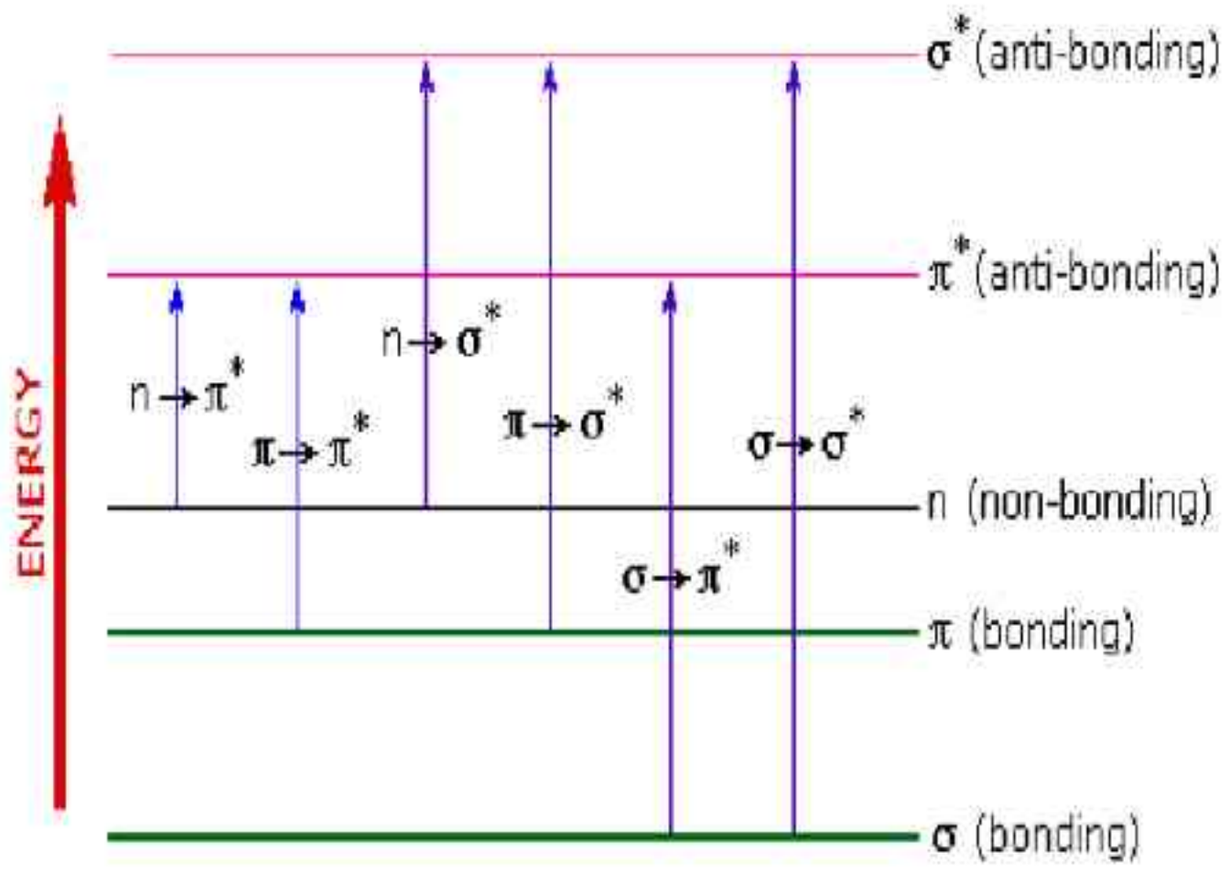


Figure 11: Electronic Excitation Energies

The UV-VIS spectrophotometer is extremely dependable, and its operation is relatively easy. The transmittance and absorbance can be calculated as,

$$\text{Transmittance} = \frac{I}{I_o}, \text{ and it is generally expressed in } \%T \quad 1.1$$

$$\text{Absorbance } (\%) = -log\ (\frac{I}{I_o}) \times 100 \quad 1.2$$

Where I is the intensities of incident light transients from the other side of the sample (I) by the initial intensity (Io)

The absorption spectra result from electrons transition from a lower to a higher energy state, while UV emission spectra result from the reverse shift. The intensity of spectral lines is determined by the probability of electronic transitions occurring in the UV region. Single- beam or double-beam UV spectrophotometers are accessible. Light passes absolutely through the sample in the first case. By ignoring the test material, the preliminary strength

I_o is considered. Despite being the initial design, it is now widely utilized in educational and industrial labs. Figure 12 depicts its graphical presentation. The incident light will be splitin the second instance. One beam is called a sample beam and the other is called a reference beam since it passes through the sample. Figure 13 shows the ray diagram for this.

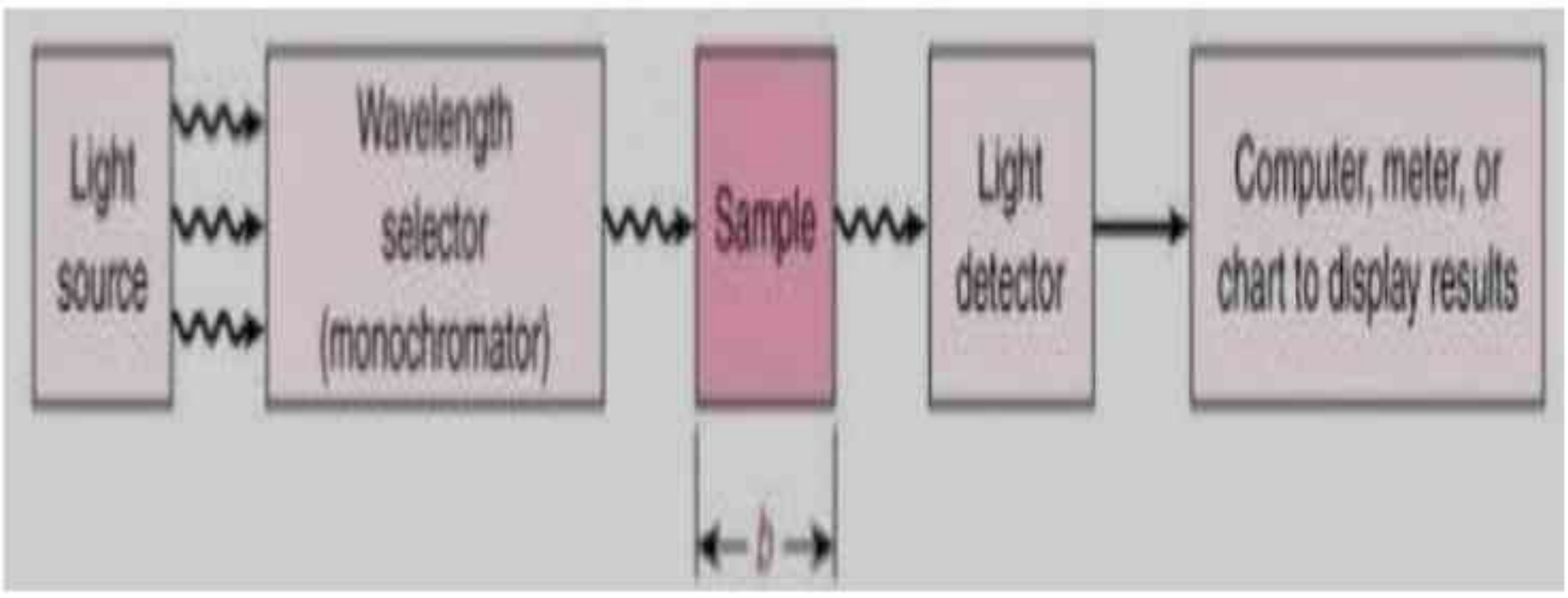


Figure 12: Configuration of a Single-Beam UV Spectrophotometer

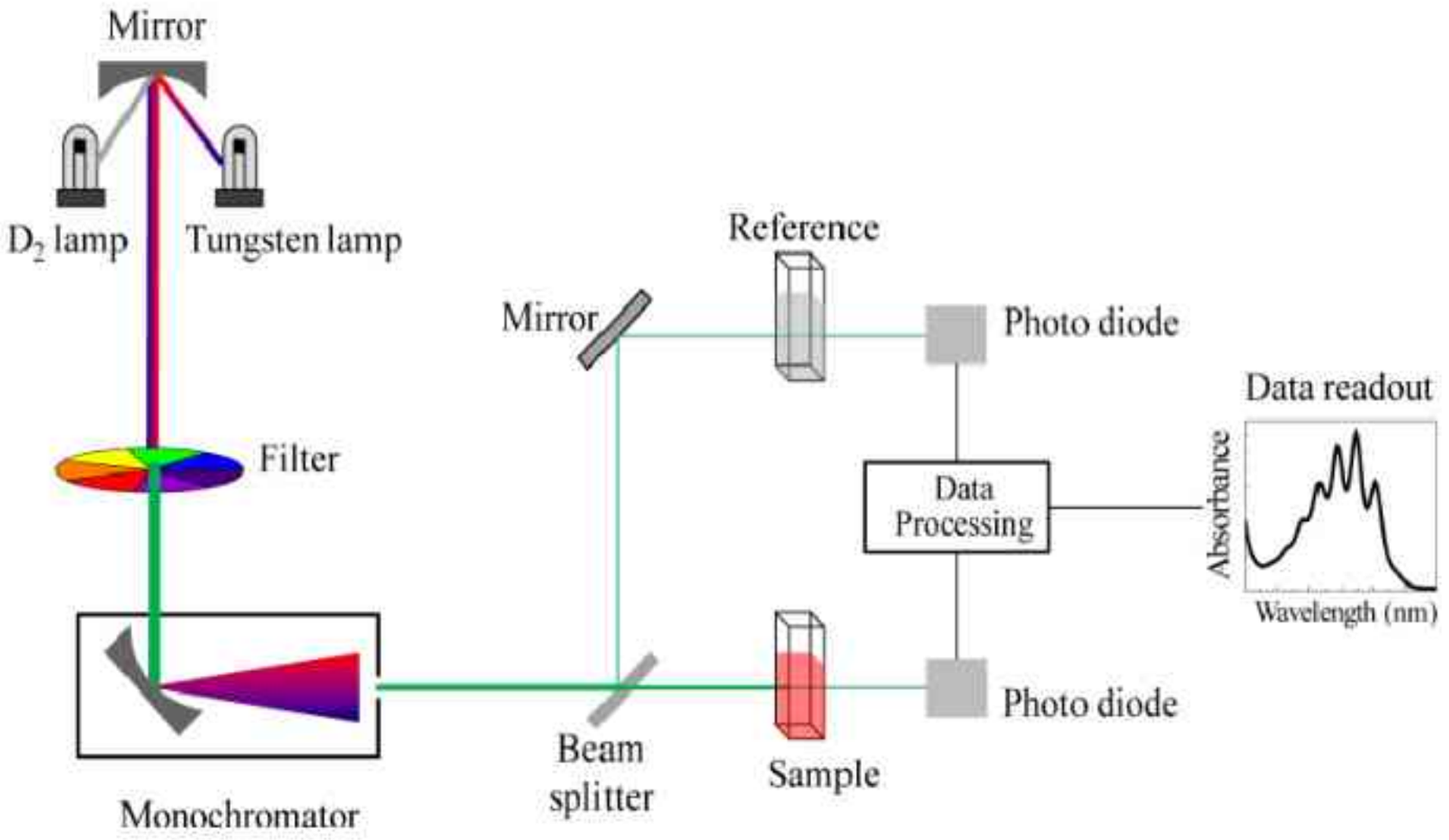


Figure 13: Configuration of a UV Spectrophotometer with Two Beams

The spectrophotometer uses a stable light source that can provide continuous radiation over the entire wavelength range. A tungsten lamp is used for visible light, and a deuterium or hydrogen lamp is used for UV light. A prism or plane grating separates a beam of light from each source into its component wavelengths. Glass, quartz, and fused silica are the most common materials used to make prisms.

The specimen absorbs a part of the incident beam while the remaining portion is conveyed to a detector. The monochromator's output radiation would be divided into two beams. The first incident is on reference, while the second fallson the specimen. The two rays are further focused on the detector. The detector's output is fed to an amplifier, which amplifies the transmitted light from both the sample as well as the reference.

The output waveform recorded on a meter, chart recorder or another form of readout system after being amplified. In terms of wavelength or frequency Vs transmission(T) or absorbance, the sample's spectrum thus represents a particular portion of the electromagnetic spectrum (A).

In the current research, UV experiments were conducted using a Varian Cary 5E spectrophotometer, depicted in figure 14.These spectral data were used to derive a number of optical properties, including the absorption co-efficient, optical reflectivity, refractive index and electrical susceptibility.

Figure 14: Varian Carry 5E Spectrophotometer

In general, the energy gap is calculated when the absorption of photons takes place. The optical band gap is a fundamental property of optical materials influenced by factors like crystalline nature and stoichiometry. In the present study, the absorption coefficient (α) was analyzed by articulating the absorbance by means of transmittance to calculate bandgap.

$$\alpha = \frac{1}{d} log \frac{1}{T} \qquad 1.3$$

Where, T is transmittance and D is thickness of the sample respectively.

Additionally, α estimates how much light can flow through the materials before being absorbed. It reflects the inter-band transition near the bandgap and is relative on both material properties and the wavelength of the light being absorbed. In the current work, for high photon energies (hν), the absorption coefficient was determined using the formula

$$\alpha h\nu = (h\nu - Eg) \qquad 1.4$$

Where Q is a transition relative parameter, h is Planck's constant, v is photon frequency,$E_g$is the material's bandgap and n is an index that can have any value(1/2, 1/3, 2, or 3) depending on the kind of transitions. The minimal-energy state in the conduction band and the maximal-energy state in the valence band are each characterized by a certain crystal momentum (k-vector) in the Brillouin zone. If the k-vectors are different, the material has an "indirect gap". a photon cannot be emitted because the electron must pass through an intermediate state and transfer momentum to the crystal lattice.

The band gap is called "direct" if the crystal momentum of electrons and holes is the same inboth the conduction band and the valence band; an electron can directly emit a photon. For the purposes of allowable direct transition, n is taken to be 1/2. Consequently, the equationis

$$\alpha = \frac{A(h\nu - Eg)^{1/2}}{h\nu} \qquad 1.5$$

By plotting the graph of $(\alpha h\nu)^2$ versus $h\nu$ in eV, for all of the grown crystals in this study, the bandgap value was calculated. Further, the resulting bandgap represents the visible region's transmittance.

Furthermore, the phrase destruction coefficient (K) relates to the nature of weak interaction or how intensely a material absorbs light at a specific wavelength. It can be calculated employing the equation.

$$K = \frac{\lambda\alpha}{4\pi} \qquad 1.6$$

As we know 'n' represents refractive index and also function of wavelength. The molar Extinction coefficient and refractive index are dependents on photon energy that designate the materials internal efficiency. Thus it is an essential crystal parameter to develop any solid- state electronic devices. The refractive index was analyzed through the formula [106].

$$\frac{n^2-1}{n^2+2} = 1 - \sqrt{\frac{E_g}{20}} \qquad 1.7$$

Where, E_g is the bandgap

The crystal optical reflectance was determined using the calculated refractive index valuesusing the equation below,

$$R = \frac{(n-1)^2}{(n+1)^2} \qquad 1.8$$

These linear optical variables can also be used to calculate the crystals' electrical susceptibility (χ_C), which is based on the fact that most naturally occurring compounds are non-magnetic at optical frequencies and hence, the refractive index is almost comparable to the relative permittivity of the material, and the analogous relationship is assigned by

$$\chi_c = \varepsilon_r - 1 \qquad 1.9$$

Or $\chi_c = n^2 - 1$

When the electrical susceptibility of a crystal is high ($\chi_c > 1$) it is easier to polarize the sample when intense light incidence it.

VI. THERMOGRAVIMETRIC ANALYSIS

Temperature dependent processing of samples is used to detect change in weight upon

temperature as well as time. The study of heat transfer across structures is frequently done using thermal analysis. In the present work, The Perkin Elmer STA 6000 thermal analyzer was used to calculate these parameters, as shown in figure 15.TGA records the precise weight of the sample as well as changes in temperature. GA is a common method for measuring material properties, moisture absorption by the sample, temperatures, decomposition points, and solvent residues, among other things. In DTA, a sample and an inert reference are heated or cooled as a function of temperature under identical conditions. As a result, measuring TGA and DTA simultaneously delivers heat flow and a rate of change in the weight of a sample in a controlled region as a function of temperature or time.

A thermo balance and a filled sample pan are usually found inside the furnace of a TGA analyzer. The null point weighing mechanism is used in the pan, usually platinum. The pan inside the furnace is electrically heated, and a thermocouple is used to measure the temperature precisely. A computer controls the unit's heating rate. The percentage sample weight (Y-axis) versus temperature (X-axis) will be plotted to test the sample. The testing of a specimen is carried with the gradual temperature rise. Transitions in DTA are caused by the sample emitting or absorbing energy compared to the reference and then plotted against time or temperature. This information can be used to determine whether the transformation is exothermic or endothermic. Changes in crystalline nature and dehydration reactions are described by sharp and large endothermic peaks, respectively. Chemical reactions in the oxidative environment, in particular, are primarily exothermic reaction.

Figure 15: STA 6000 thermal analyzer by Perkin Elmer

VII. FESEM AND EDAX STUDIES

The morphological investigation of the crystals can be aided by electron microscopy. Here, to obtain high-resolution images, the scanning is done using sample crossways. The generate the electron beam, the tungsten filament functions as a cathode in a vacuum in the SEM. The electrons emitted by the cathode attracted to the anode would be collimated as they pass through the condenser lens. Consequently, the objective lenses concentrate them on a specific point on the test sample. This is depicted schematically in figure 1.16. Finally, secondary electrons are generated when the electron beam comes into contact with the sample. A scintillation material that causes light flashes will be used to detect these.

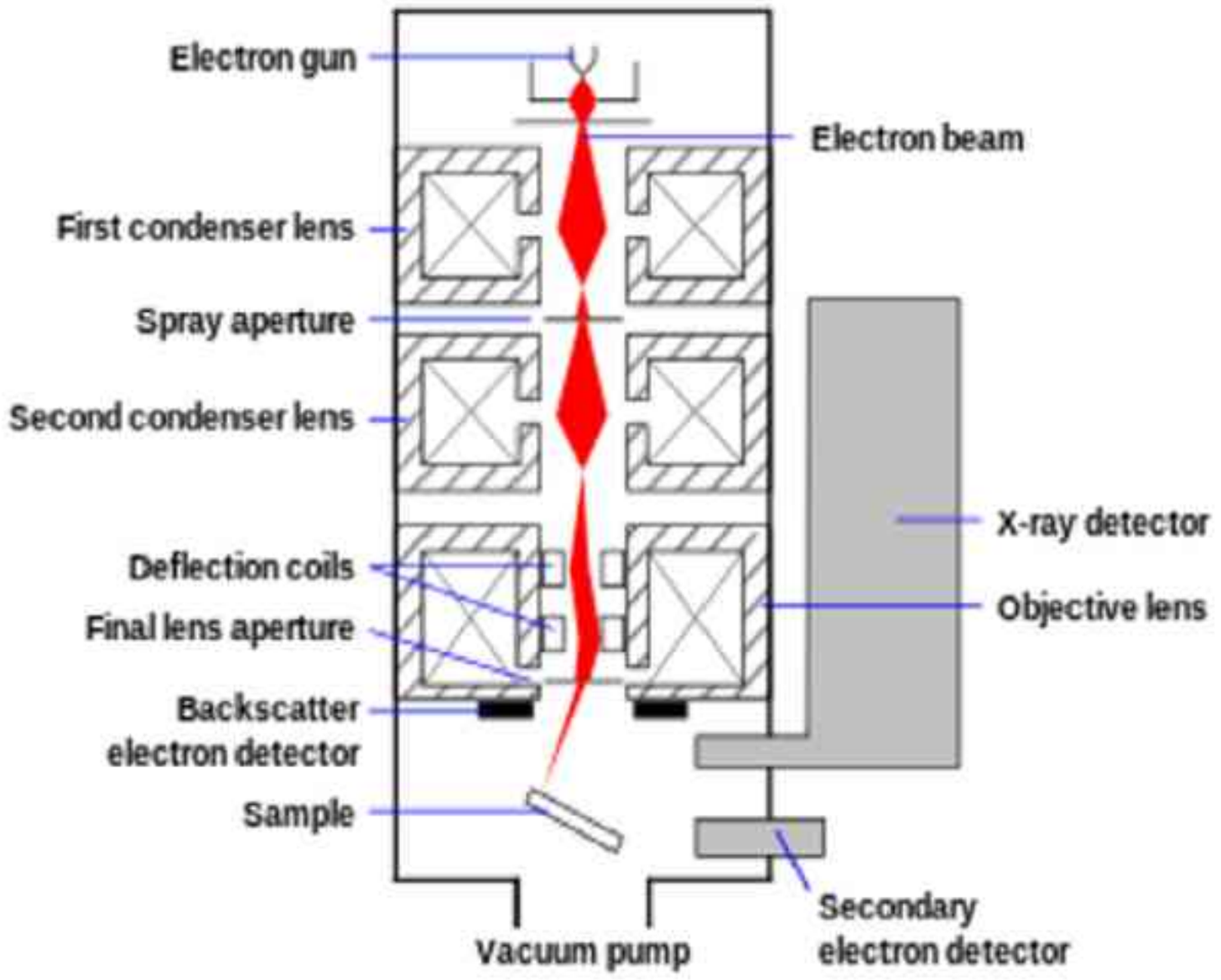


Figure 16: Schematic Representation of SEM-EDAX Analysis

The sample topography is specified in terms of light spots of varying intensities in the SEM image. The compositional information comes from the backscattered electrons. SEM includes the EDAX analysis system as a standard feature. During the EDAX investigation, the specimen electrons are bombarded with high-energy electrons, enabling them to transition to higher energy shells. X-rays are released as a result of these electrons' downward transition. The transformation releases a specific amount of energy, depending on the type of transition. The intensity V/S the energy of the released X–rays produce the EDAX spectrum. For the current study, the FEI QUANTA 200F and the JEOL Model JSM-6390 have used for SEM and EDAX study, as given in figure 17.

Figure 17: SEM-EDAXFEI QUANTA 200F and JEOL Model JSM-6390

VIII. DIELECTRIC STUDIES

The present research benefits in the interpretation of solids' electrical responses. As schematically depicted in figure 1.18, the dielectric constant and dielectric loss are both highly frequency dependent characteristics. The amount of electric stress and energy that is absorbed by the sample is referred to as the dielectric constant and loss in terms of the structure of atoms, ions, and bonding. The value of dielectric constant declines with expanding frequency in most organic and semi organic crystals, which is a typical dielectric activity.

Total polarization in a dielectric medium is determined by the dipoles' capacity to orient themselves in relation to the applied changing domain. At different frequencies, the frequency of polarization varies significantly. Electronic, ionic, dipolar and space charge polarizations are all feasible in the audio frequency range and the resultant polarizability is the sum of all of these. Due of the low frequencies involved. The dipoles would have enough time to align themselves with the field position. The dipoles would have enough time to align themselves with the field position. The dipole will easily obey the changing phrase if the relaxation time of the dipole is lower than half the length of the electric phrase. As the frequency rises, polarization mechanisms will be deactivated one by one as they are unable to react to the changing electric field. Electronic polarization makes an important contribution at higher frequencies (10^{15}Hz).

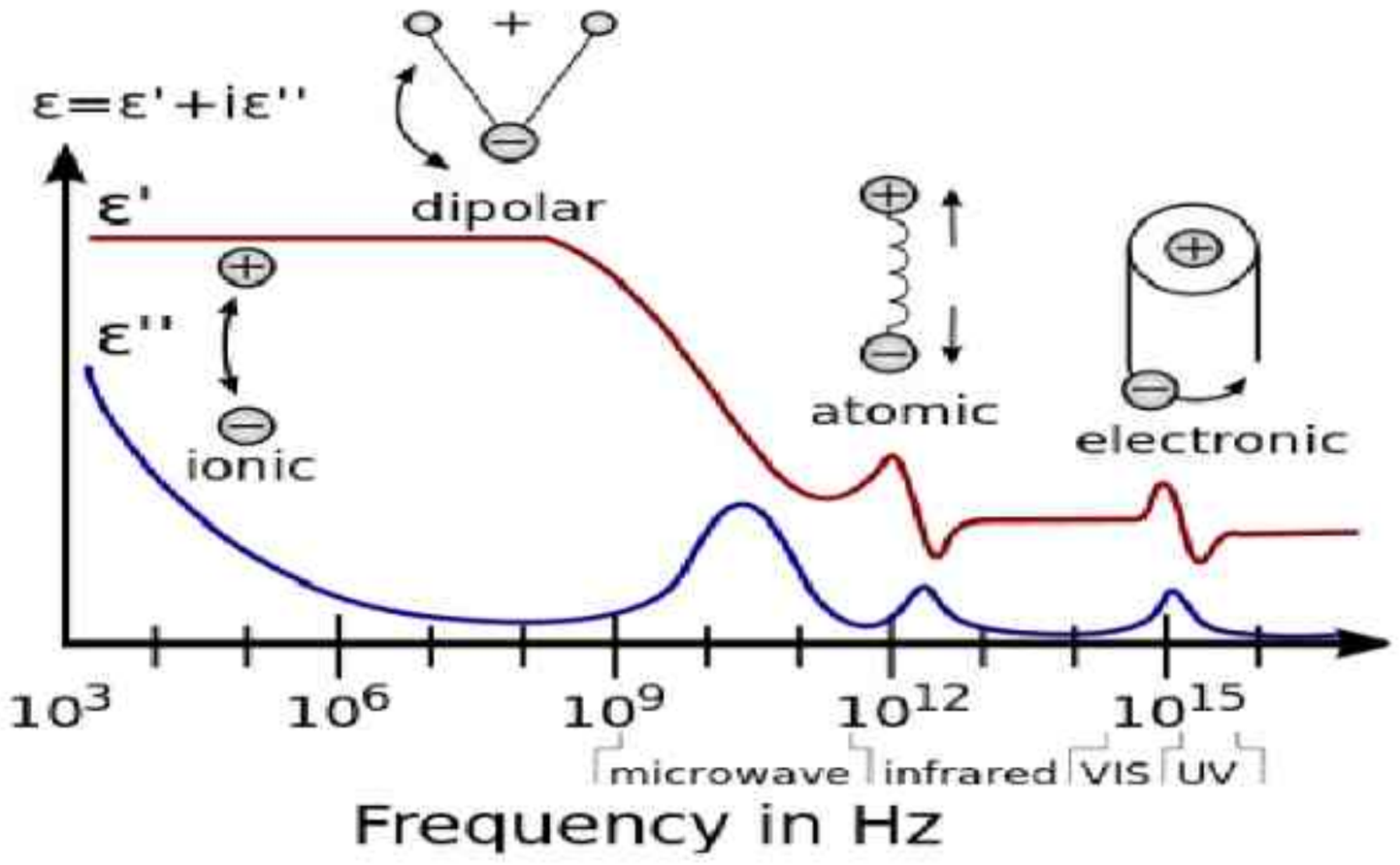


Figure 18: Dielectric constant frequency dependence in terms of different polarizations

Furthermore, the specimen is subjected to an electric phrase and over time turns into heat energy, a portion of the electrical energy is dissipated. In actual dielectric materials, this loss factor is regarded as a dielectric loss. A material must have a high-frequency region with little dielectric loss. This denotes a material's consistency, which dependent on the sample's purity and such samples have applications in the microelectronic industry.

Figure 19 represents the typical HIOKI 3532-50 HITESTER LCR meter utilized for determining dielectric parameters with variation in frequency range from100 Hz to 5 MHz at ambient temperature. To do this, silver paste was applied in layers to the sample's opposing

faces in order to produce an ohmic contact that might behave as a dielectric medium. The silver paste was carefully applied to the crystal's other sides to prevent it from spreading. The capacitance (C) and dielectric loss factor of the testing materials are determined by placing them between the copper platforms and electrodes.

The dielectric constant (ε_r)was evaluated using the formula

$$\varepsilon_r = \frac{Cd}{s_0 A} \qquad 1.10$$

Where ε_O= 8.854×10^{-12} F/m is permittivity of the free space, $d$is thickness and A is the areaof the sample under investigation respectively.

$$tan\,\delta = {}^{1}/_{\omega cR} \qquad 1.11$$

Dielectrics only conduct a small amount of electric current in operation and they have resistivities between 1010 and 1020 ohm-m. The relationship between the dielectric constant and the dissipation factor was utilized to determine AC conductivity (ac).

$$\sigma_{ac} = \epsilon_r \epsilon_o\, 2\pi f\, tan\delta \qquad 1.12$$

This limitation helps in determining the impact of space charge polarization on crystal growth.

Figure 19: HIOKI 352-50 LCR HITESTER

IX. MICRO HARDNESS STUDIES

The microhardness analysis aids in the apprehension of the sample strength and deformation. It's also worth noting that the mechanical features of NLO specimen are highly correlated. The resistance to composition destruction or deformation is measured by hardness. Its value is evaluated by the elasticity and plasticity of the indenter material under evaluation, as well as the quantification conditions. The three hardness measurements are Scratch stiffness, indentation stiffness and dynamic stiffness. The indentation hardness measure is ideally fitted for samples divided into micro and macro indentation. The forces in

a micro indentation test usually are less than 2N. Figure 1.20 shows that pre-polished surfaces involve testing materials with low applied loads.

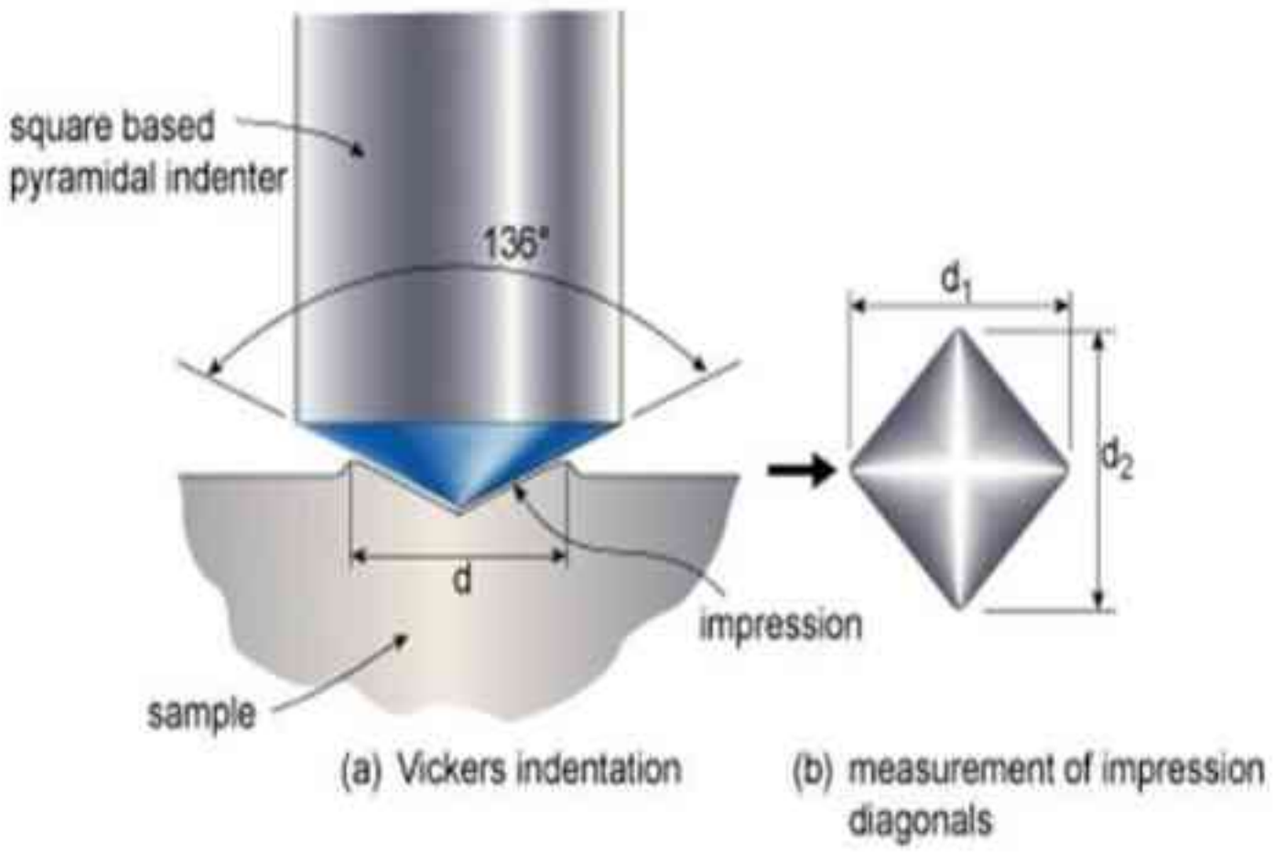


Figure 20: A typical Vickers's Diamond Pyramid Indentor

Using a source-based pyramid indenter, Vickers static micro indentation measurements were performed. The experiments are carried out at room temperature. The most widely accepted pyramid indenter is one whose opposite sides intersect at the apex at an angle (α) of 136°.The proportion of the applied load to the indentation region is known as hardness. Hence, the Vicker's hardness number HV is expressed as

$$H_V = \frac{Load}{Pyramidal\,area} = \frac{2P\sin(\alpha/2)}{d^2} = \frac{1.8544\,P}{d^2}\ \text{Kg/mm}^2 \qquad 1.13$$

Where, 'P' is applied weight in gm and 'd' is the average diagonal length in micrometer. Different weights ranging from 5 to 250 gms may be used for indentation. The size of the indentation impression is measured using a calibrated microscope. According to Mayer's rule, the relationship between applied weight and indentation size is given by

$$P = kd^n \text{ or}$$

$$\log p = \log k + n \log d \qquad 1.14$$

Where, k is constant for a particular sample. The value of 'n' refers to Mayer's index. Plotting the usually linear graph of log p and log d yields the value of n and the consequent slope is calculated. If n>2, H_V will increase with weight and $H_V$will lower if n <2.

Furthermore, for hard samples, the value 'n' should be between 1 and 1.6, while for soft materials, it should be greater than 1.6.The grown crystals were classified based on this information. The hardness study helps in understanding the strength and deformation of the crystal.

Hardness is a measure of resistance against structural destruction or deformation. Its

value depends on elastic and plastic properties of indenter material under test and also measurement conditions. Micro indentation test is usually has forces less than 2N. It involves testing of materials with low applied loads and pre polished surfaces, for using this indentation test to find out liquid inclusions.

The elastic stiffness constant (C11) is a material quality that indicates how much energy can be absorbed by the material before it fractures. It also measures resistance to deformation by a load applied to the flat crystal surface. The tightness of the bonding with neighboring atoms and the rate of variance with atom position are the two most significant factors in determining C11 values.

The corresponding C 11 value for the applied weights on the sample was calculated using the formula below. The Wooster formula

$$C_{11} = (H_V)^{\frac{7}{4}} \qquad 1.15$$

Yield strength (σ_V) is the stress under which a specimen begins to warp plastically beforedeforming elastically. The value of $\sigma_V$was evaluated by using the formula

$$\sigma_V = \frac{H_V}{2.9}[1-(n-2)]\left(\frac{12.5(n-2)}{1-(n-2)}\right)^{n-2} \qquad 1.16$$

The mechanical parameters of the current study were measured using a SHIMADZU HMV- 2T microhardness tester, as shown in figure 21 and in the relevant chapters, the estimated mechanical parameters are tabulated.

Figure 21: SHIMADZU HMV-2T Microhardness Tester

X. TECHNIQUE OF KURTZ POWDER FOR DETERMINING NLOPROPERTIES

It is among the most popular technique for determining the properties of NLOs. Crystallographers use this approach to determine if the structure's center of symmetry is absent. This method helps determine the impact of grain size on conversion efficiency and compares effectiveness to available material. In addition, It is possible to evaluate the noncritical phase-matching wavelength for a particular material and the capability to phase match using a tunable laser.

A beam of laser is used to incident a solid microcrystalline material in the Kurtz technique. The second harmonic wave is captured, filtered, identified and compared to a standard. Since the response's magnitude depends on particle size, caution should be exercised when preparing the crystal (e.g. Using a sieve to ensure a limited range of particle sizes). Figure 22 depicts the experimental diagrammatic configuration of a slightly changed Kurtz Perry setup.

The reference and excitation sources were both a Nd: YAG pulsed laser. The beam was split into two parts, one for reference and other for excitation. A photomultiplier was also used to detect the reference beam and determine its beam energy. The second will be used to elicit a response from the test sample. To obtain SHG intensity, the output light intensity was recorded on an oscilloscope. The elementary and harmonic intensitiesratio determines the sample's efficiency. Additionally, a sample of urea or KDP with equivalent particle size to be measured and an efficiency ratio will be depicted, to prevent potential experimental set-up errors. Figure 23 depicts the powder SHG quantification experimental setup.

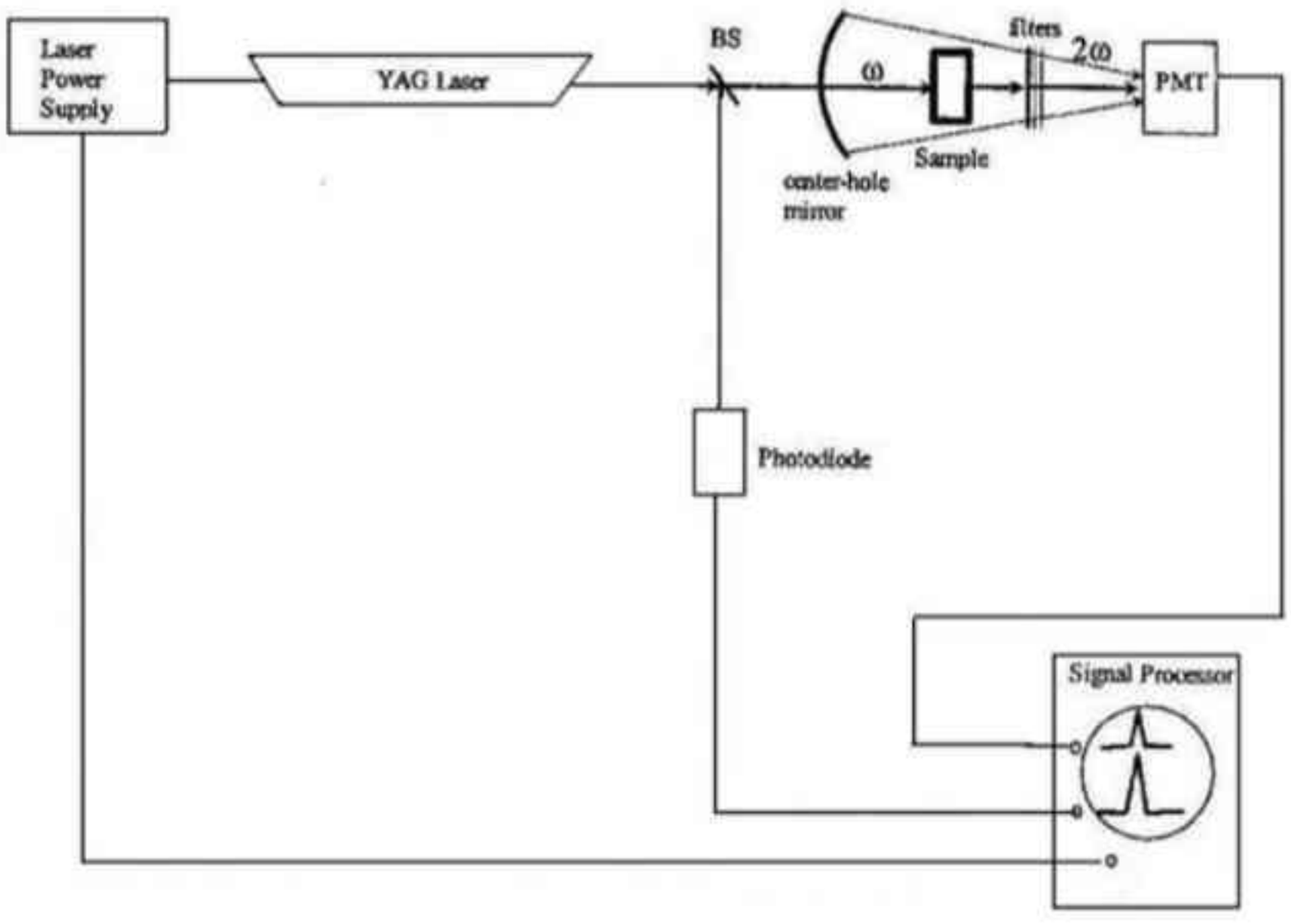
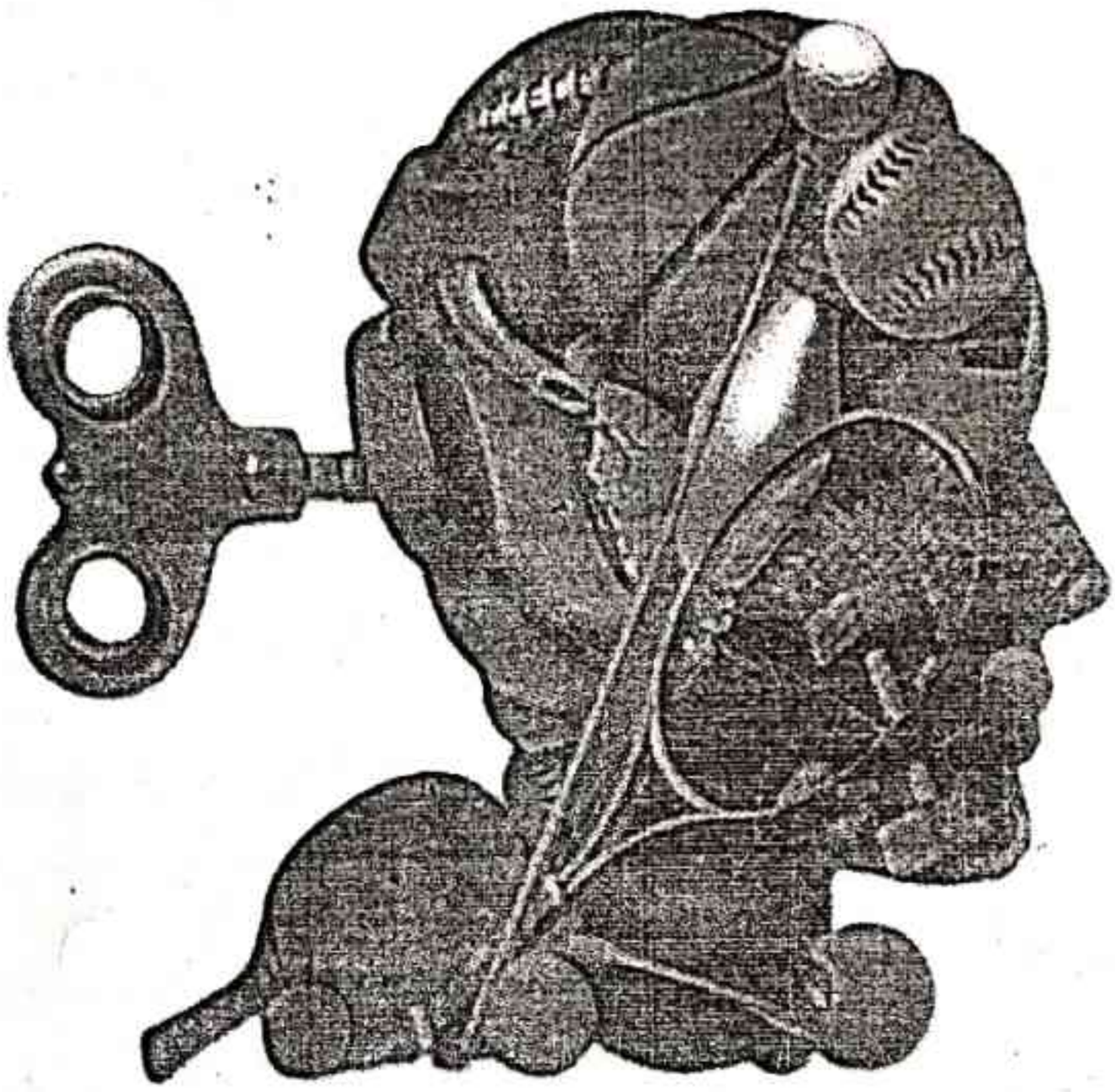


Figure 22: Schematic Design of Kurtz Powder Method

Figure 23: Experimental Set Up of Powder NLO Test

ESSENTIALS OF SPORTS PSYCHOLOGY

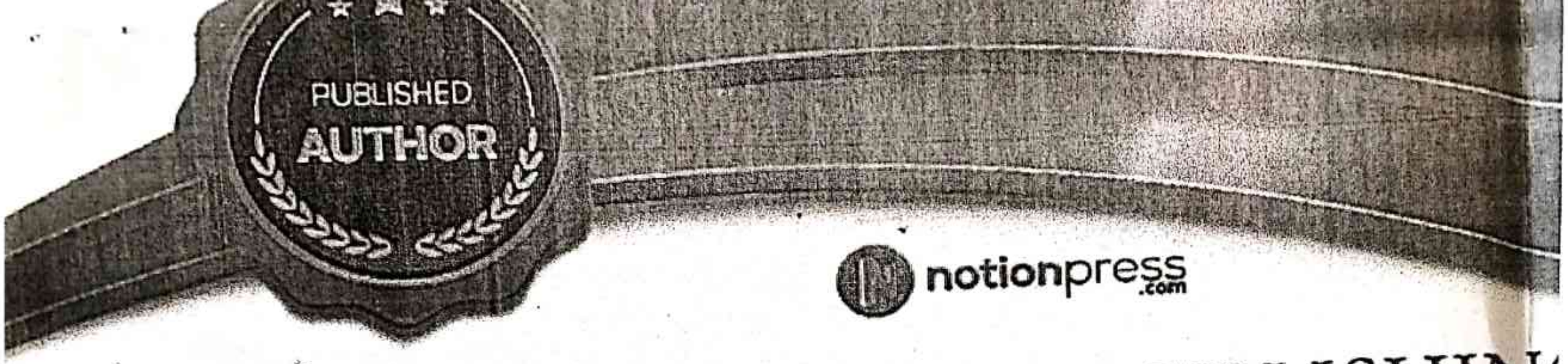


Sachin K

Contents

This book analyses the essential aspects of sports psychology by throwing light on issues related to the upkeep of athletes' mental state and improving their performance in sports activities. On one hand, it covers topics like anxiety, stress, conflicts, overtraining, and sports injuries, and on the other, it includes strategies helpful for managing and developing skills for better performance in various sports activities.

Sachin K.



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