

## Summary of Research Papers.

Infrared spectroscopy is a widely used technique in chemistry that involves analyzing the interaction between infrared light and a sample. It operates in the infrared region of the electromagnetic spectrum, which has longer wavelengths and lower frequencies than visible light. This technique is primarily based on absorption spectroscopy, where molecules absorb specific frequencies of infrared light corresponding to their vibrational and rotational energy levels.

The infrared spectrum is divided into different regions, including the mid-infrared and far-infrared regions. The mid-infrared region, ranging from approximately 4000 to 400  $\text{cm}^{-1}$ , is commonly used to study the fundamental vibrations and rotational-vibrational structure of molecules. On the other hand, the far-infrared region, ranging from approximately 400 to 10  $\text{cm}^{-1}$ , has lower energy and is used for rotational spectroscopy, often in conjunction with microwave spectroscopy.

The naming and classification of these subregions are conventional and loosely based on molecular and electromagnetic properties. Infrared spectroscopy is particularly valuable for organic and inorganic chemists as it allows them to identify and analyze the chemical functional groups present in a given sample.

One class of compounds that has been extensively studied using infrared spectroscopy is Schiff bases. Schiff bases are compounds that contain a carbon-nitrogen double bond, with the nitrogen atom connected to an aryl or alkyl group. They can be synthesized through various methods and have been investigated for their coordination properties and biological activities.

Infrared spectroscopy plays a significant role in the characterization of Schiff bases and their metal complexes. By analyzing the infrared spectra, valuable information about the bonding nature, molecular geometry, and coordination modes of the ligands with metal ions can be obtained. Additional spectroscopic techniques like UV-Vis (ultraviolet-visible), EPR (electron paramagnetic resonance), NMR (nuclear magnetic resonance), and elemental analysis are often employed alongside infrared spectroscopy to gain a comprehensive understanding of the synthesized compounds.

Furthermore, the antibacterial and antifungal activities of Schiff bases and their metal complexes can be evaluated using various assays. These studies aim to explore the potential applications of these compounds in the field of medicine and drug development.

In summary, infrared spectroscopy is a crucial technique for the characterization and analysis of Schiff bases and their metal complexes. It provides valuable insights into their chemical properties, coordination behavior, and potential applications. By studying the infrared spectra, researchers can gain a deeper understanding of the compounds' molecular structures and make

informed decisions regarding their use in various fields, such as medicine and materials science.

#### Summary In Bullet Points.

- Infrared spectroscopy analyzes the interaction between infrared light and a sample in the infrared region of the electromagnetic spectrum.
- It is based on absorption spectroscopy, where molecules absorb specific frequencies of infrared light.
- The infrared spectrum is divided into regions, including the mid-infrared and far-infrared regions.
- The mid-infrared region ( $4000\text{--}400\text{ cm}^{-1}$ ) is used to study fundamental vibrations and rotational-vibrational structure.
- The far-infrared region ( $400\text{--}10\text{ cm}^{-1}$ ) is used for rotational spectroscopy.
- Infrared spectroscopy is commonly used by organic and inorganic chemists to identify chemical functional groups.
- Schiff bases are compounds with a carbon-nitrogen double bond and are studied using infrared spectroscopy.
- Infrared spectroscopy helps characterize Schiff bases and their metal complexes, providing information about bonding, molecular geometry, and coordination modes.
- Additional spectroscopic techniques like UV-Vis, EPR, NMR, and elemental analysis are used alongside infrared spectroscopy.
- Antibacterial and antifungal activities of Schiff bases and their metal complexes can be evaluated using assays.
- Infrared spectroscopy is crucial for understanding the chemical properties and potential applications of Schiff bases and their metal complexes.
- It plays a role in various fields, including medicine and materials science.