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Neutron and infrared spectroscopy: Complimentary tools for vibrational studies.

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A low energy band pass neutron spectrometer that operates in the range of $\sim 50\text{--}1200\text{ cm}^{-1}$ has very recently been commissioned and first experiments run at the OPAL reactor. The so-called Beryllium-filter spectrometer is predominantly used to obtain vibrational density of states spectra from those materials that contain hydrogen, thus making this instrument especially important in the chemical, biological, geological and environmental sciences. In many aspects a neutron spectrum obtained using the Beryllium-filter spectrometer is very similar to spectra obtained in the far-infrared or terahertz regime making neutron spectroscopy a complementary technique to other spectroscopies such as photon (electromagnetic radiation)-based techniques. The neutron's properties are unique amongst other fundamental probes like light, such as outstanding materials penetrability, isotopic sensitivity, magnetic sensitivity and lack of vibrational selection rules. A number of interesting examples are presented that highlight the capabilities and complementarity of vibrational neutron spectroscopy.

Keywords

Neutron, infrared, molecular vibrational spectroscopy.

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