AN 334
Semiconductor Structural Studies by Raman Spectroscopy

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Discussion

Raman spectroscopy can be used as an effective tool for structural characterization of semiconductors. Among many applications in semiconductor studies, Raman measurements provide a means of probing the lattice dynamics of disordered solids thus giving insight into the structure, bonding and nature of the disorder.

Raman peaks of well-defined phonons in single crystal semiconductors are very sharp. Asymmetrical peak broadening and a shift to lower frequencies occur in the spectra of polycrystalline and amorphous semiconductors. This is caused by the disorder introduced in their structure.

Raman spectra of crystalline silicon (c-Si), polycrystalline silicon (p-Si), amorphous silicon (a-Si) and silicon micro crystallites (µc-Si) embedded in an amorphous matrix are shown in Figure 1. The Raman shift and/or peak asymmetry and bandwidth can be used effectively to measure the crystallite dimensions and bond-angle distortions for amorphous semiconductors. The data show that crystallites in polycrystalline silicon are not larger than 25 Å.

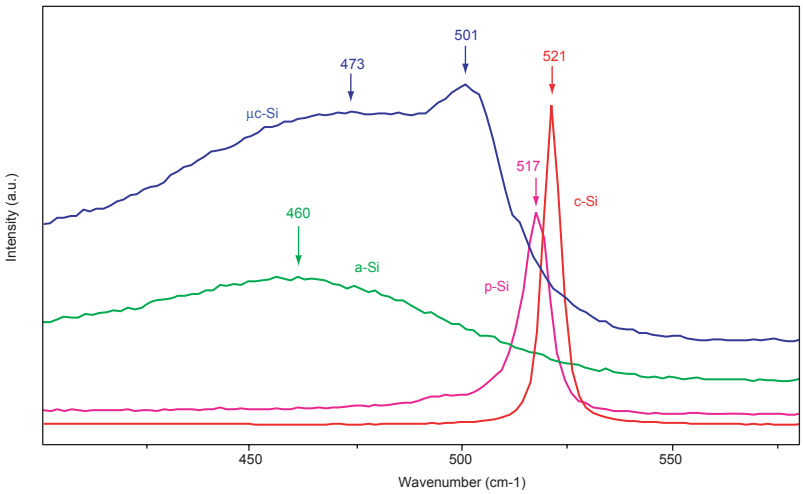

Figure 1

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