Terahertz Spectroscopy

Terry Threlfall, Phil Taday

University of Southampton, SO17 1BJ, UK, Teraview Ltd, Cambridge, UK

Insofar as polymorphs can be regarded as different packings of the same molecules[1], those analytical techniques which emphasize intermolecular effects rather than intramolecular effects should be generally useful for identifying and quantifying polymorphs. Far infrared and low frequency Raman spectra are largely dependent on lattice vibrations (so-called phonon modes) and so fall into this category, but are accessible only with difficulty to conventional instrumentation. Terahertz laser pulse spectroscopy[2] uses novel technology to provide infrared spectra in the region 0-150cm^{-1} within which lattice vibrations occur. An explanation of the relationship between lattice vibrations and hydrogen bonding will be given. Amorphous samples cannot have coherent lattice vibrations. Therefore amorphous and crystalline samples can be distingushed by Terahertz spectroscopy and mixtures quantified. Qualitative and quantitative applications of the technique to pharmaceutical polymorphs including sulphathiazole[3] and carbamazepine[4] will be shown.

References

1. Threlfall, Analyst 1995, 120, 2435-2460

2. Taday, Spectroscopy Europe, 2004, in press

3. Apperley, fletton,Harris, Lancaster, Tavener, Threlfall, J. Pharm. Sci, 1999, 88, 1275-1280

4. Gresniak et al, J. Pharm. Sci., 2003, 92, 2260-2271