

Questions for the mid-term evaluation
Panel: advanced spectroscopic methods

Part 1 – EPR

1. Describe the relationship between the symmetry of the paramagnetic centre (a molecule or an ion, in the case of non-molecular systems - the nearest neighbourhood of the paramagnetic centre) and the symmetry of the EPR spectrum.
2. Compare the capabilities of the EPR technique to study a molecular copper(II) complex and a copper(II) ion dispersed in an oxide matrix. What interpretive difficulties can be encountered when analysing a powder EPR spectrum? What kind of chemical information is hidden in EPR tensor parameters (g and A tensors)?
3. Describe ways to manipulate the spatial orientation of the spin magnetic dipole moment and the basic Hahn spin echo formation experiment. Explain the basic differences (arising from the nature of magnetic moments) in NMR and EPR Fourier techniques.

Part 2 –Raman spectroscopy

1. Similarities and differences between Surface Enhanced Raman Spectroscopy (SERS) and Tip-Enhanced Raman Spectroscopy (TERS).
2. Discuss chosen technique of nonlinear Raman spectroscopy.
3. What information on the sample may be provided by Raman Imaging combined with AFM?

Part 3 – IR spectroscopy

1. Methodology of measuring acid-redox properties of solids by IR. Qualitative and quantitative aspect.
2. Time-resolved IR spectroscopy. What kind of information is provided by rapid scanning techniques?
3. The interaction of a molecule with the surface. What information can be obtained from the IR spectroscopic measurement?

Part 4 – NMR

1. Homo- and heteronuclear techniques of two-dimensional NMR spectroscopy
2. The AIDA-NMR experiment as a technique to study protein/inhibitor interactions
3. DEPT NMR technique, types and applications.