Consiglio Nazionale delle Ricerche
Istituto dei Materiali per l'Elettronica ed il Magnetismo

SEMINARIO

Sala A, I° Piano, CNR-IMEM, Parma | 18 gennaio 2024 | ore 11:30

Vibrational spectroscopy to investigate polymorphism and phase transitions in organic semiconductor crystals

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Vibrational spectroscopic techniques, as IR and Raman, are powerful tools to investigate crystal packing and phase transitions of organic semiconductors, that display a rich variety of structural changes. Such materials have many appealing features ranging from good processability, flexibility, light weight, tunable optical and transport properties making them candidates for electronic applications.

Raman spectroscopy in the THz region probes the intermolecular vibrations (lattice phonons), that reflect the intermolecular interactions and unit cell symmetry, thus giving the fingerprint of a crystal phase. The use of polarized light on oriented single crystals also gives phonon symmetry species, associated with directional information on the molecular displacements involved. Combining the separate analysis of lattice dynamics along specific directions might even lead to the mechanism of phase transitions.

Following this novel approach, I investigated crystalline organic semiconductors with polymorphism and temperature or pressure induced phase transitions [1] [2] [3]. The THz Raman measurements were integrated with the polarized IR and Raman spectra in the mid-IR range to assess the molecular orientation.

References

[1] Ferrari, E .; Pandolfi, L.; Schweicher, G.; Geerts, Y.; Salzillo, T.; Masino, M. and Venuti, E.; Chem. Mater. 35, 15, 5777–5783 (2023)
[2] Ferrari, E.; Mezzadri, F.; Masino, M. ; Crystals 13 (10), 1428 (2023),
[3] Ferrari, E.; Mezzadri, F.; Masino M., Physical Review B, 2022, 105, 054106