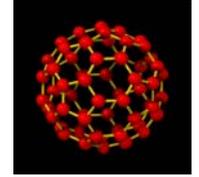
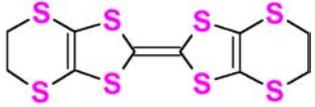
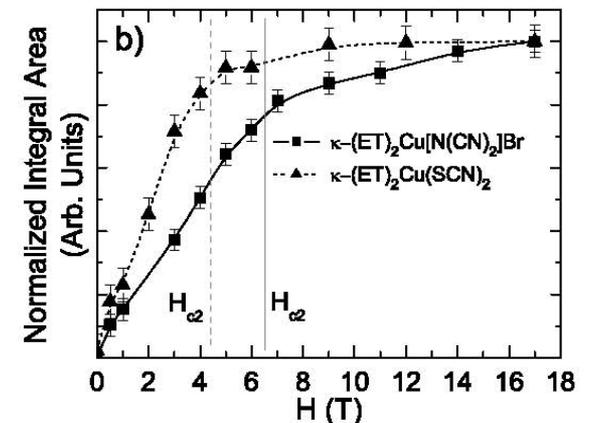
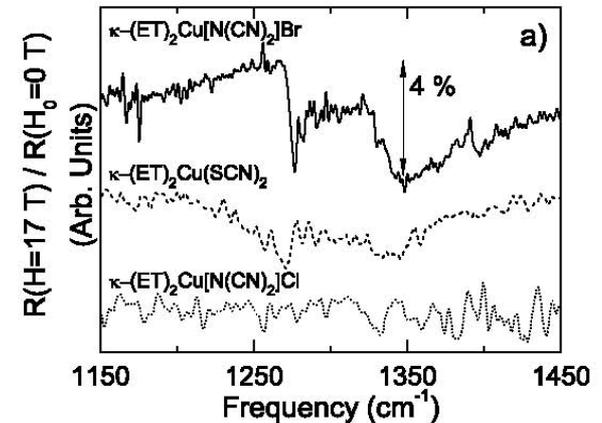


Chemical Structure / Physical Property Relationships in Layered Organic Solids as Investigated by Infrared Spectroscopy



J.L. Musfeldt, University of Tennessee, DMR-0139414

- Organic molecular solids are excellent models for the investigation of superconductivity because the important energy scales can be modified by both chemical and physical tuning.
- In κ -(ET)₂Cu[N(CN)₂]Br, magneto-infrared measurements show that intramolecular vibrational modes are involved in the superconducting to normal state transition below T_c.
- In β'' -(ET)₂SF₅RSO₃, anion tuning can be used to modify the hydrogen bonding and alter the charge transfer characteristics.
- We also investigated the dynamics of linear C₆₀ polymers; both on-ball distortion and charging effects were assessed.



We measured the magneto-infrared spectrum of three quasi-isostructural kappa-phase organic molecular solids: kappa-(ET)₂Cu[N(CN)₂]Br, (T_c = 11.8 K), kappa-(ET)₂Cu(SCN)₂ (T_c = 10.4 K), and the non-superconducting kappa-(ET)₂Cu[N(CN)₂]Cl analog. Our results support the partial role of electron-molecular vibrational coupling in the pairing mechanism of layered organic superconductors, and we identify the most important totally symmetric modes in kappa-(ET)₂Cu[N(CN)₂]Br within the non-planar molecular building block picture.

The figure on the right shows the changes in the totally symmetric C=C stretching mode between the superconducting and normal states. The effects correlate with H_{c2}. No magnetic field-induced changes are observed for the Cl material.

Education and Human Development

Musfeldt Group, University of Tennessee

- **Broad, interdisciplinary training of students in materials spectroscopy**
- **Close interaction and collaboration with materials design and theory groups**
- **14 undergraduates and 3 high school students over an 8 year period.**
- **~40% female participation, with one student an African American female.**
- **Projects in the area of organic superconductivity provide group members with important opportunities at every level of seniority and interest. High school, undergraduate, and graduate students as well as postdoctoral researchers have been involved in these projects.**



Luncheon of the Boating Party
By Renoir

Altered by Serena Dai for the Musfeldt Group Picture, 2004.

From left to right: Serena (lady with the dog), Bo (redheaded oarsmen), Jan (lady looking far away), Ram (small man in the back), Roman (man talking with a lady), Jinbo (man with white sweater), and Jason (man looking towards the dog).