**Pressure-induced superconductivity in a quasi-one-dimensional organic conductor (TMTTF)2*X*:** **Insights into Electron Correlation under High Pressure**

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The electronic correlations in quasi-one-dimensional organic conductors (TMT*C*F)2*X* (*C* = S, Se; *X* = monovalent anion) exhibit strong sensitivity to pressure variations. The different electronic phases emerging under pressure are systematically analyzed through a unified temperature–pressure (*T*–*P*) phase diagram, which compares the effects of chemical and applied pressure [1]. For example, (TMTTF)2PF6 and (TMTTF)2SbF6 display distinct ground states at ambient pressure: (TMTTF)2PF6 undergoes a charge-ordered (CO) phase transition and subsequently enters a spin-Peierls (sP) phase (*T*CO ~ 70 K, *T*SP ~ 15 K), whereas (TMTTF)2SbF6 exhibits a CO phase followed by an antiferromagnetic (AF) phase (*T*CO = 154 K, *T*AF = 8 K). Upon applying pressure, both materials show superconductivity at approximately 5 GPa [2,3]. The extended electronic correlation diagram for (TMTTF)2*X*, taking (TMTTF)2TaF6 as the reference at ambient pressure [4], shows a sequential evolution of ground states at low temperatures: from AF to sP, AF(I), spin-density wave (SDW), and finally a superconducting (SC) phase.

Although pressure-dependent structural data for (TMTTF)2PF6 up to ~2.7 GPa were reported by Rose *et al.* [5], single-crystal X-ray diffraction measurements above 5 GPa—where superconductivity emerges—have remained elusive due to experimental challenges. We have recently determined the pressure-dependent structures of (TMTTF)2*X* (*X* = PF6 and SbF6) using a diamond anvil cell (DAC). These results, coupled with first-principles effective model analyses, reveal the evolution of electronic correlations in (TMTTF)2*X* under external pressures up to 8 GPa [6].

This talk will present a comprehensive view of how pressure modulates the structural and electronic properties of (TMTTF)2*X* and will discuss the resulting pressure–temperature phase diagram from both experimental and theoretical perspectives.

References

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