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The State of Superconductivity in the 1D Organics[1]

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We report on the status of the superconducting state in the quasi-1D molecular organic superconductors $(TMTSF)_2X$, on this 25^{th} anniversary of organic superconductivity. A number of experimental results over the last decade, mostly on X=ClO_4 and PF_6, address the nature of the Cooper pairing in these materials, which surprisingly is not a settled issue. Critical field (via transport), NMR (including Knight shift) and impurity studies are suggestive of unconventional pairing, converging on spin triplet as a top candidate. Muon spin rotation and thermal conductivity results are less conclusive. More recently, the large H_{c2} (well beyond the Pauli limit) has been confirmed by magnetization, and tunneling on a bicrystal shows a large midgap (zero-bias) state, strengthening the case for triplet superconductivity. The talk will include a discussion of the spin triplet configurations (p– and f –wave) available for $(TMTSF)_2X$, and will propose an order parameter **d**-vector consistent with the experiments.

Work done in collaboration with Heon-Ick Ha (present address, Harvard University) and Jeong-Il Oh

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