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The Effects of Stoichiometry on the Optical Properties of PTZ-TCNQ Charge Transfer Crystals IRIS STONE, JAYDEEP JOSHI, George Mason University, ROBERT SMITH, SCOTT MELIS, EDWARD VAN KEUREN, Georgetown University, PATRICK VORA, George Mason University — Charge transfer (CT) crystals are two-component organic materials formed by stacked pairs of donor and acceptor molecules. Depending on the choice of donor and acceptor molecules it is possible to achieve semiconducting, insulating, or metallic characteristics, making the CT crystal platform potentially transformative for applications in low-cost flexible electronics. The use of phenothiazine (PTZ) donors and tetracyanoquinodimethane (TCNQ) acceptors is predicted to result in a semiconducting state with high electron and hole mobilities, properties that are ideal for ambipolar transistors. Here, we seek to understand the effect of stoichiometry on the optical and electronic properties of PTZ:TCNQ CT crystals by comparing nanowires with 1:1 stoichiometry to a novel 3:1 stoichiometry using temperature-dependent optical spectroscopy. Ensemble photoluminescence and absorption measurements indicate that a CT state forms in the 1:1 sample, whereas the 3:1 sample exhibits weaker coupling between TCNQ and PTZ. These results support a strong correlation between stoichiometry and optical properties. Our observations give important insight into how the intermolecular coupling varies with stoichiometry and are crucial to future efforts to realize an organic ambipolar transistor.

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