Modeling of light-induced transformations of cooperative electronic states.

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Semi-phenomenological approach allows to model spacio-temporal effects in the course of optically induced transformations [1] of cooperative states. For two-dimensional systems (following experiments from D. Mihailovic group) it was possible to describe: dynamic symmetry breaking, stratification with subsequent collapses of domain walls for CDWs like in TbTe3, and the recently discovered switching to a truly stable hidden state in a CDW-polaron-Mott state of the TaS2. For organic chains with neutral-ionic transformations (following experiments by S. Koshihara and recently by H. Okamoto group) we take into account interplay of molecular excitons, charge disproportionation and lattice dimerization which lead to intrinsically heterogeneous patterns of competing phases. For CDWs, transitions are driven by inequilibrium electrons interacting with the lattice; in neutral-ionic case a quasi-condensate of excitons appears as a macroscopic quantum state which then evolves into patterns interacting with other degrees of freedom prone to instability. The excitons, pumped to or relaxed at a coherent delocalized quantum state, can provoke local commutations between the stable and the metastable phases even below the pumping threshold.

[1] Electronic States and Phases Induced by Electric or Optical Impacts, S. Brazovskii and N. Kirova Eds., Eur. Phys. J. Special Topics, **222**, Issue 5 (2013).