

Minute structural changes may lead to drastic modifications of the electronic properties of quasi-1D systems, while, on the other hand, an electronic charge redistribution, induced, e.g., by optical excitations or surface vibrations may induce pronounced structural modifications in such systems. This is illustrated in my talk using two prominent examples: (i) Localized photoholes at the Brillouin zone boundary of the In/Si(111)(8x2) nanowire system are shown to drive an ultrafast (8x2) $\rightarrow$ (4x1) phase transitions that is accompanied by the formation of metallic In-In bonds (see Fig. 1) along the wire direction [1,2]. (ii) A Si $sp^3 \rightarrow sp^2 + p$ rehybridization accompanied by a lateral surface charge transfer is demonstrated to destabilize the Si(553)-Au spin chains [3] with respect to a diamagnetic surface ground state that complies with electron counting heuristics [4]. Thermal excitation leads to soft Au chain vibrations that alter transiently the Au electron affinity and eventually the hybridization of the Si step edge atoms [5].

- [1] T Frigge *et al.*, Nature **544**, 207 (2017).
 [2] CW Nicholson *et al.*, Science **362**, 821 (2018).
 [3] SC Erwin and FJ Himpsel, Nat. Commun. **1**, 58 (2010).
 [4] C Braun *et al.*, Phys. Rev. B **98**, 121402(R) (2018).
 [5] C Braun *et al.*, Phys. Rev. Lett. **124**, 146802 (2020).

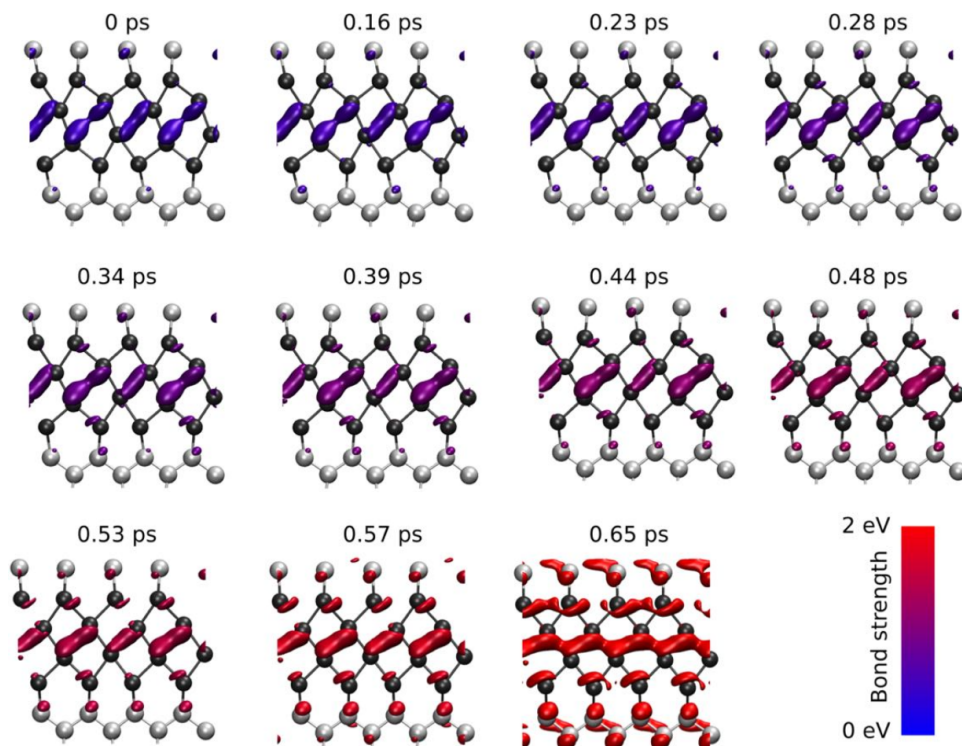


Fig. 1: Subpicosecond formation of metallic bonds subsequently to the optical excitation of the In/Si(111)(8x2) surface, cf. Refs. [1,2].