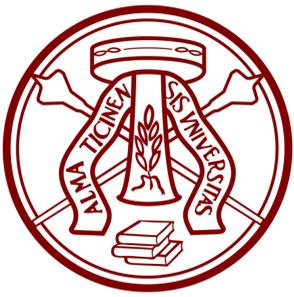


Coexisting superconductivity and charge-density wave induced by hydrogen intercalation in TiSe₂

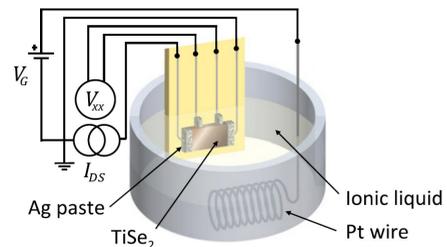
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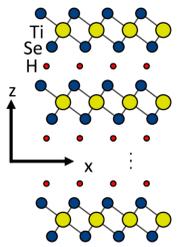
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Summary

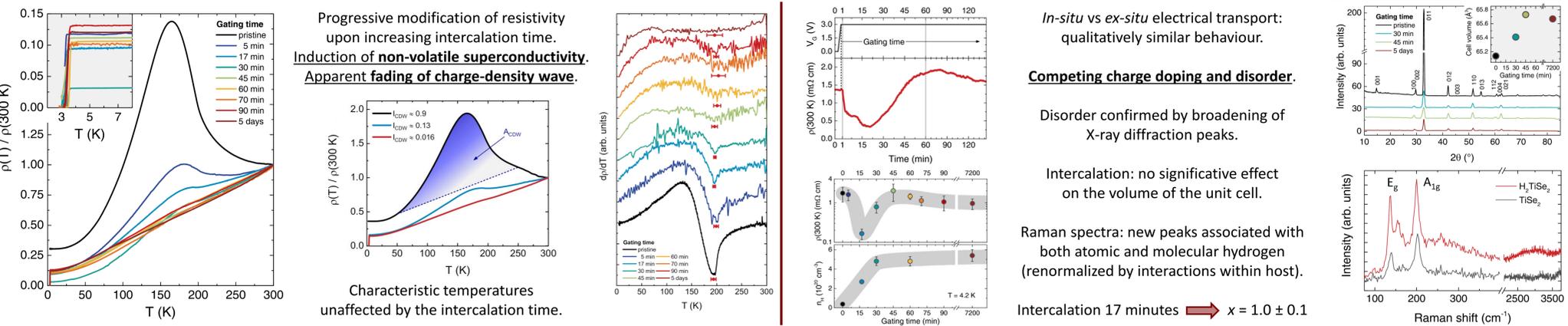


We demonstrate the non-volatile control of the electronic ground state of titanium di-selenide via ionic liquid gating-driven intercalation of hydrogen [1]. The hydrogenation induces a superconducting phase, observed together with a charge-density wave through most of the phase diagram, with nearly doping-independent transition temperatures. This unique behavior is supported by *ab-initio* calculations showing that high concentrations of H dopants induce a full reconstruction of the band-structure, although with little coupling between electrons and high-frequency phonons. Also, we use the nuclear magnetic moments of the intercalants as local probes for magnetic resonance experiments [2]. We argue that fluctuating mesoscopic-sized domains nucleate already at temperatures higher than the bulk critical temperature to the charge-density-wave phase and display cluster-glass-like dynamics in the MHz range. Additionally, we observe a well-defined independent dynamical process at lower temperatures. We associate this feature with the collective phason-like motion of the charge-density wave being hindered by structural defects and chemical impurities and resulting in a localized oscillating motion.

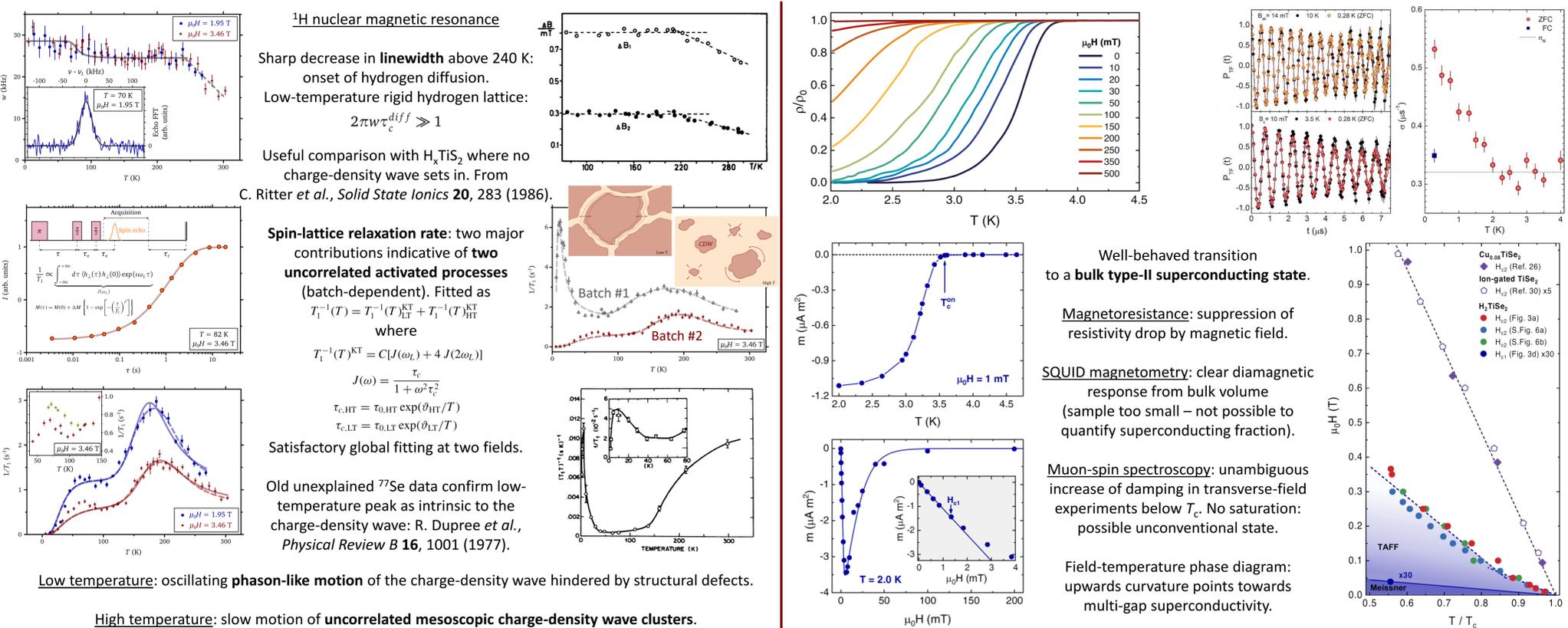


[1] E. Piatti, G. Prando *et al.*, *Communications Physics* **6**, 202 (2023); [2] G. Prando, E. Piatti *et al.*, *Physical Review Materials* **7**, 094002 (2023).

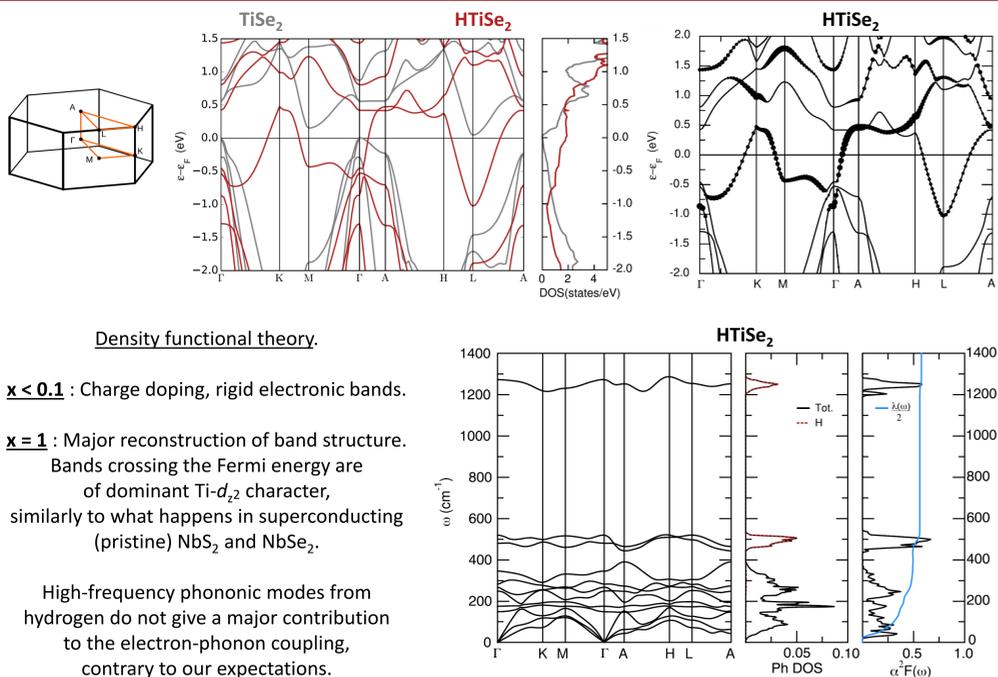
Ionic liquid gating-driven hydrogen intercalation of TiSe₂



Cluster charge-density wave glass and superconductivity



Electronic band structure and phonons



Phase diagram

