1D molecular chains: topology and spin crossover

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Recent progress in on-surface chemistry enabled the synthesizing and characterizing of novel-conjugated carbon molecules with magnetic properties systems with unprecedented properties [1]. This route, complemented with high-resolution scanning probe imaging (SPM), provides new opportunities to understand their chemical and physical properties, including the emergence of magnetism in such materials [2].

In the first part of the talk, we will discuss the connection between the topological band structure of -conjugated polymer introduced in the framework of the Su-Schrieffer-Heeger (SSH) model and their conjugation. We will discuss the quantum phase transition between two topologically distinct phases of the π-conjugated polymer [3]. This quantum phase transition is defined by the length of the polymer, triggered by the transition from topologically trivial to a non-trivial phase above a certain polymer length. We demonstrate that the pseudo-Jahn-Teller effect is the driving mechanism responsible for the quantum phase transition [4].

In the second part, we introduce on-surface synthesis of 1D coordination π-d conjugated polymers, achieved by co-deposition of 2HQDI molecular precursor and various transition metals (Fe, Co, Ni, Cr, Cu) atoms on metal surfaces under UHV conditions. This route enabled us to form magnetic π-d organometallic polymers with lengths up to hundreds of nanometers [4]. We will demonstrate fully reversible multiconfigurational light-driven spin crossover switches in a single π-d organometallic Co-QDI chain suspended between two electrodes [5].

References:
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