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"Cold Denaturation" induces inversion of dipole and spin transfer in chiral peptide monolayers SOUMYAJIT SARKAR, MEITAL ECKSHTAIN-LEVI, EYAL CAPUA, SIVAN REFAELY-ABRAMSON, YULIAN GAVRILOV, SHINTO MATHEW, Weizmann Institute of Science, YOSSI PALTIEL, The Hebrew University, Jerusalem, YAAKOV LEVY, LEEOR KRONIK, RON NAAMAN, Weizmann Institute of Science — Using a combination of several experimental and computational techniques, we show that the α-helix structure of oligopeptides based on alanine and aminoisobutyric acid is transformed to a more linear conformation upon cooling, due to interaction with neighboring molecules in a self-assembled monolayer (SAM) structure. This process is similar to the known "cold denaturation" in peptides, but here the SAM plays the role of the solvent. Our DFT-based first principles calculations show that the structural change results in a flip in the direction of the electrical dipole moment of the adsorbed molecules. The dipole flip is accompanied by an associated change in the spin channel that is preferred in electron transfer through the molecules. This is also experimentally observed via a new solid state hybrid organic-inorganic device that is based on the Hall effect, but operates with no external magnetic field or magnetic material.

Soumyajit Sarkar
Weizmann Institute of Science

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