Effects of chiral polypeptides on magnetic domain pinning and skyrmion dynamics

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Chirality is an intrinsic property of many fascinating systems. Some of them are hosted in magnetic thin films, as chiral spin structures, such as skyrmions, others are within the vast world of chemistry, helix structures for example, most famously DNA. Chiral polypeptides are of specific interest within this world as they display large chiral-induced spin-selectivity (CISS), a property unique to chiral systems and also of recent interest to the magnetism community. CISS provides new methods to manipulate magnetic materials and it has recently be shown that the adhesion of chiral molecules can switch the magnetization of a thin Co layer [Ben Dor]

We investigate the interaction of chiral molecules with magnetic thin films utilizing magneto-optical Kerr-effect (Kerr) microscopy. We employ different methods to adhere the chiral polypeptides, such as drop-casting, self-assembly, and selective adhesion. We observe the effects of domain pinning, rotation of domains, the delay of the spin reorientation transition, and reduced thermal motion of the skyrmions. These results display the early results of incorporating CISS into magnetic thin films. Showcasing the potential of chiral molecules to address challenges in skyrmionics, with promising applications in advanced magnetic devices.

[1] O. Ben Dor et al. ‘Magnetization Switching in Ferromagnets by Adsorbed Chiral Molecules without Current or External Magnetic Field’. *Nature Communications* **8**, 14567 (2017)