Spin-Orbit Physics at Magnetic Interfaces

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Magnetic materials lacking inversion symmetry constitute a unique platform for the exploration and control of magnetism. In these systems, typically multilayers of transition metal ferromagnets and heavy metals (W, Pt, Bi_2Se_3 etc.), interfacial spin-orbit coupling promotes a wealth of physical phenomena, among which the eme rgence of magnetic skyrmions – topological magnetic textures –, spin-orbit torques – an efficient means to el ectrically control magnetization dynamics –, as well as chiral magnetic damping – energy dissipation that de pends on the texture chirality. In this lecture, my intention is to give a pedagogical overview of the various as pects of the interplay between spin transport and magnetization dynamics mediated by spin-orbit coupling. I will first inspect the nature of interfacial spin-orbit coupling in magnetic multilayers and examine how it facilit ates the onset of chiral magnetic textures. I will then focus on the physics of spin-orbit torques, and present t heir general features in magnetic heterostructures as well as in the newly discovered two-dimensional magne ts. Finally, I will show how these torques can be used as new means to electrically manipulate and excite anti ferromagnetic materials.