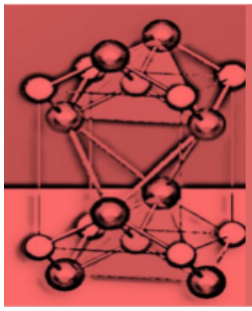

X Workshop on Novel Methods for Electronic Structure Calculations

04th – 06th December 2023
La Plata – Argentina

Interfacial interdiffusion and formation of skyrmions: Pd/Co/Pd as a test case

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Skyrmions are magnetic nanostructures which have promising applications in the design of new technologies, especially in storage devices. One of the main interactions known to be responsible for its stabilization is the Dzyaloshinskii-Moriya interaction (DMI), which arises in the presence of broken inversion symmetry and its strength is related to a large spin-orbit coupling (SOC). Asymmetric interfaces, which combine magnetic and heavy elements, attracted the main attention in the search for skyrmions. But curiously, recent experimental works have placed symmetrical interfaces in perspective as candidates to host topological magnetic nanostructures, with the observation of room temperature skyrmions in Pd/Co/Pd multilayers [1]. The origin of a non-null DMI in these symmetrical stackings is still controversial. Here, using a Real-Space [2] method to perform electronic structure calculations in the framework of the Density Functional Theory (DFT) in combination with Atomistic Spin Dynamics simulations [3], we investigate Pd/Co/Pd multilayers, focusing on correlating interfacial atomic intermixing and the formation of skyrmionic phases. As an important result [4], we show that the DMI strength is strongly enhanced by the presence of defects, due to a local symmetry breaking induced in the system.

[1]. J. Brandão et al., Sci. Rep. 9, 4144 (2019).

[2]. S. Frota-Pessôa, Phys. Rev. B 46, 14570 (1992).

[3]. B. Skubic et al., J. Phys. Cond. Matt. 20, 315203 (2008).

[4]. P.C.Carvalho et al, Nano Lett. 23, 4854(2023).