Condensed Matter Physics Institute Seminar

14:00 | Thursday 10th December | Market Square Seminar Room

All-optical magnetization reversal with femtosecond laser pulses: the role of interfaces

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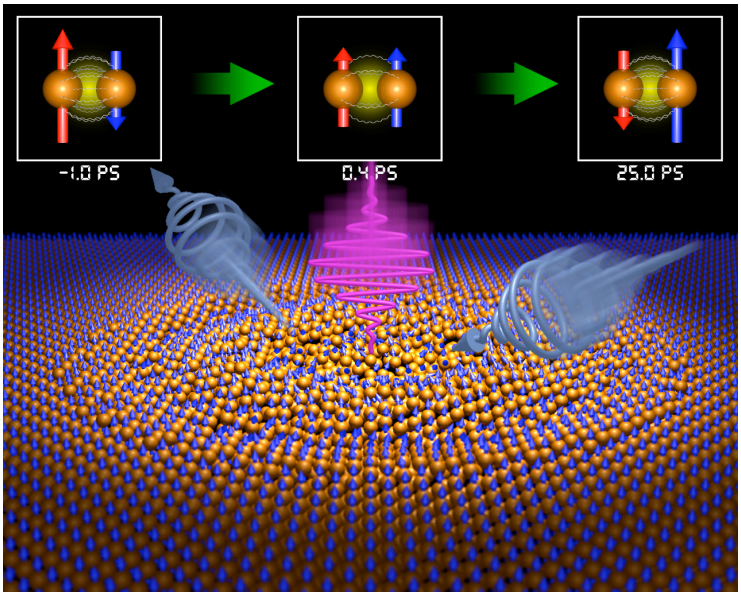
The action of electric field of light on electronic dipoles, being the largest perturbation in physics of light-matter interaction, conserves the spin of electron. This is one of the reasons why the femtosecond inverse Faraday effect in orthoferrites [1] and helicity-dependent all-optical magnetic switching in ferrimagnetic GdFeCo alloys [2] are among the most heavily debated topics in ultrafast magnetism. In my talk I will review the progress in understanding of the ultrafast laser-induced spin dynamics in metallic alloys and multilayers highlighting the strengths and weaknesses of the first theoretical models for the helicity-dependent all-optical magnetic switching [5,6]. Note that practically all systems exhibiting all-optical switching are either multi-sublattice alloys or multilayers [3,4]. More particularly, all-optical switching has not been observed in simple single-element films but alloys or interfacial structure that mix *3d* and *4f* elements (*e.g.* Fe and Gd); *3d* and *4d* elements (*e.g.* Co and Pd) or *3d* and *5d* (*e.g.* Fe or Co and Pt or Ir) in alloys or heterostructures. Based on the experiments in the X-ray [7] and THz spectral range [8] it will be argued that the interfacial and intersublattice exchange interactions and interfacial spin orbit interaction do play in the optical control of magnetism a decisive role.



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