

Interaction of surface acoustic waves and magnetic thin films

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Magnetic data manipulation using electrical current is inefficient, and fundamentally there is scope for improvement by a factor 1000. A promising route to low-power magnetic devices is to apply a voltage to a piezoelectric material that exerts strain on an adjacent magnetic thin film and manipulates its properties via magnetoelasticity. As a proof-of-principle, we have used a piezoelectric to apply strain to a Co/Pt multilayer, a magnetic thin film with preferred magnetization direction out-of-plane, and studied how strain modifies the energy barrier for magnetization switching. Films with magnetization out-of-plane are suitable for scaling to the smallest devices and will be used in this project.

Using a time-varying strain, such as that provided by surface acoustic waves, could enable very fast switching and has the potential for focusing or interference to manipulate magnetic spin structures. This project will combine the internationally leading expertise in surface acoustic waves in the School of Electronic and Electrical Engineering with that in thin film magnetism in the School of Physics to study the interaction of the surface acoustic waves with magnetic multilayer films such as Co/Pt. The films will be sputter-grown onto substrates that support surface acoustic waves. Lithographic techniques will be used to define surface acoustic wave transducers and pattern magnetic films, and high-frequency transport and magnetic imaging techniques will be used to characterise them.