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Room Temperature Skyrmions in Pt/Co/Ta Multilayers

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Magnetic skyrmions are topologically stabilized spin configurations on the nanoscale which makes them promising for next-generation information storage technologies and computing. [1,2] In magnetic multilayers, they can be stabilized at room temperature [3]. Skyrmions emerge due to an interplay between several magnetic contributions. Among them the interfacial Dzyaloshinskii-Moriya Interaction (DMI) drives the spins into non-collinear orientation, while the perpendicular magnetic anisotropy (PMA) favours the out-of-plane orientation and the shape anisotropy prefers in-plane spin orientation.
Polycrystalline [Pt(40 Å)/Co(x)/Ta(19 Å)]$_N$ multilayers were fabricated in a molecular beam epitaxy setup by thermal deposition on oxidized Si(001) substrates with a buffer layer of 47 Å Ta and a 30 Å Pt cap layer. The Co film thickness was varied between 5 Å and 21 Å, the number of repetitions varied between 8 and 10. Magnetic force microscopy measurements reveal the existence of skyrmions at a Co thickness between 9 Å and 17 Å. We discuss results obtained from magnetic hysteresis, transport and neutron reflectometry measurements. The latter have been performed with the neutron reflectometer Platypus at ANSTO, Australia.

References

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