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Tailoring magnetic skyrmions at transition-metal interfaces BERTRAND DUPÉ, MARKUS HOFFMAN, CHARLES PAILLARD, STEFAN HEINZE, Christian Albrechts University of Kiel — Skyrmions in magnetic materials offer attractive perspectives for future spintronic applications [1] since they are localized, topologically stabilized spin structures which can be manipulated at electric current densities which are by orders of magnitude lower than those required for moving domain walls. Recently, it has been discovered that due to the broken inversion symmetry at surfaces magnetic skyrmions can also occur in ultra-thin transition metal films at surfaces [2,3]. Here, we use first-principles electronic structure theory to show how transition-metal interfaces can be modified such that they exhibit skyrmion phases and to explain the observation of individual skyrmions in an ultra-thin film composed of Pd and Fe on the Ir(111) surface [3,4]. We determine the magnetic interactions in this system using density functional theory and explain the occurrence of skyrmion phases in an external magnetic field using Monte-Carlo simulations. Our work paves the way to tailor the properties of skyrmions at transition-metal interfaces.

[1] A. Fert et al Nature Nanotech. **8**, 152 (2013).
[2] S. Heinze et al Nature Phys. **7**, 713 (2011).
[3] N. Romming et al Science **341**, 636 (2013).
[4] B. Dupé et al Nature Comm., **5**, 4030 (2014).

Bertrand Dupé
Christian Albrechts University of Kiel

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