

Magnetic skyrmions in monoatomic-thin Gadolinium square-shaped nanoislands

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Abstract: Magnetic skyrmions are topologically protected spin configurations with particle-like properties, currently receiving considerable attention as a potential route for novel data storage and spintronics applications. In this work, the spin distributions in monoatomic-thin Gadolinium square-shaped nanoislands are theoretically investigated using the atomistic spin dynamics simulations. The most important conclusion drawn from our analysis is that monoatomic-thin Gadolinium square-shaped nanoislands exhibit a magnetic phase transition: spin-spiral configurations to round Néel-type skyrmions for an applied magnetic field of 1.5 T (T for Tesla) and temperatures of 20 K (K for Kelvin). Furthermore, our findings confirm that skyrmion number, size, and shape is sensitive to the applied magnetic field. The appearance of skyrmions in a technologically relevant rare-earth element like Gadolinium could potentially revolutionize skyrmionics.