Magnetism in rutile-type oxides

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While rutile-type transition metal oxides (TMO_2) have been widely used in a variety of important applications such as an active catalyst, supercapacitors, batteries, and fuel cells, an existence of intrinsic magnetism in RuO_2 has recently drawn much attention in spintronics. In this study, we have performed the density-functional theory plus U (DFT+U) calculations on magnetism and magnetic anisotropy energies (MAE) of RuO_2 and OsO_2. These oxides are identified to favor an antiferromagnetic phase, which is a result of mutual mechanisms of Kramer-Anderson superexchange interaction and Jahn-Teller effects. More remarkably, we found very large MAE up to an order of 10 meV per transition metal atom in bulk, which are four orders of magnitude greater than those of the conventional transition metals. This anisotropic phenomenon further exhibits a persistently increasing dependence of film thickness, which is very uncommon in thin film materials.

Biography

Dorj Odkhuu has completed his PhD in Physics from University of Ulsan in 2014 and Postdoctoral studies from Ulsan National Institute of Science and Technology and California State University Northridge. He is currently an Assistant Professor at Incheon National University, South Korea. His research focuses on first-principles calculations of magnetic and magnetoelectric materials and he has published more than 40 papers in peer-reviewed journals.

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