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High-magnetization oxide spinel ferrite films

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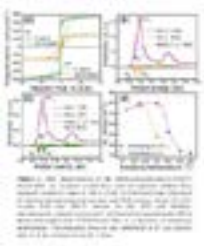
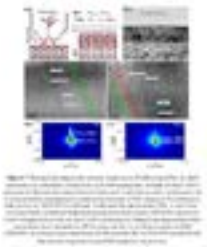
Tetragonal half-metallic magnets find broad applications in spintronics owing to the optimized magnetization and magnetic anisotropy. Herein, a low-temperature thermal decomposition method is utilized to grow new stabilized tetragonal ferrite films. Tetragonal Fe_3O_4-based film possesses high saturation magnetizations of ~1 Tesla and tetragonal Co-doped Fe_3O_4-based film exhibits high energy product of ~10.9 MGOe with perpendicular magnetocrystalline anisotropy. A combined experimental and first-principles study reveals that carbon interstitials (C_i^B) and oxygen vacancies (VO) form C_i^B-V_O pairs which stabilize the tetragonal phase and meanwhile enhancing the magnetization. The high magnetization is attributed to the spin flipping on FeA as a result of the C_i^B-V_O-induced atomic migration and lattice distortion. The novel stabilized tetragonal ferrite films with high and tunable magnetization and magnetic anisotropy largely extends the applications of half-metallic spinel ferrites and novel energy harvest devices.





Biography

Dr Jun Ding is Professor at Department of Materials Science & Engineering, National University of Singapore. He has been working on functional materials (particularly magnetic materials) over 25 years. His current research is focusing on additive manufacturing (3D printing) with the emphasis of advanced functional and multi-functional devices.

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