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Cobalt -doped Titanium dioxide nanomaterials for spintronics application

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The advancement of spintronics, a technology that leverages the electron's spin in addition to its charge, demands materials with unique combinations of magnetic and electronic properties. Cobalt (Co)-doped titanium dioxide (TiO_2) has emerged as a promising candidate for such applications due to its potential to exhibit room-temperature ferromagnetism alongside semiconducting behaviour. This study explores the synthesis of Co-doped TiO_2 using the solid-state reaction method, aiming to optimize its structural, optical, and magnetic properties for spintronic functionality. Characterization techniques such as XRD, FTIR, SEM, TEM, UV-Vis spectroscopy, and SQUID magnetometry were employed to analyse the effects of cobalt doping on TiO_2. The results reveal successful Co incorporation into the TiO_2 lattice, leading to lattice distortions, bandgap narrowing, and enhanced magnetic behaviour. These findings highlight the critical interplay between doping concentration, structural integrity, and functional properties. The study concludes that Co-doped TiO_2 exhibits the necessary attributes for next-generation spintronic devices, offering a promising platform for integrating magnetic and electronic components.

Abstract Category

Materials Physics

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