**Abstract**

In this paper, CeO2 and cobalt-doped CeO2 nanorods synthesized by surfactant free co-precipitation method. The microstructures of the synthesized products were characterized by XRD, FESEM and TEM. The structural properties of the grown nanorods have been investigated using electron diffraction and X-ray diffraction. High resolution transmission electron microscopy studies show the polycrystalline nature of the Co-doped cerium oxide nanorods with a length of about 300 nm and a diameter of about 10 nm were produced. The X-ray Photoelectron spectrum confirms the presence of cobalt in cerium oxide nanorods. From BET, the specific surface area of the CeO2 (Co-doped) nanostructures (131 m2 g−1) is found to be significantly higher than that of pure CeO2 (52 m2 g−1). The Co-doped cerium nanorods exhibit an excellent photocatalytic performance in rapidly degrading azodyes acid orange 7 (AO7) in aqueous solution under UV illumination.