**Abstract**

The rising awareness of the need for a healthy environment for living systems has led to an increasing demand for suitable catalyst materials for wastewater treatment. In this connection, in the present work, the catalyst materials Hydroxyapatite and Hydroxyapatite/Tantalum (HAp/Ta) core–shell nanostructured particles were prepared through a facile nanoprecipitation method without a surfactant, chelating agents and/or ligands. The prepared nanostructured particles were characterised with the help of several analytical techniques namely XRD, FESEM, TEM, EDS, FTIR, Raman, XPS and BET. The calculated average crystallite size of HAp was found to be 26 nm and the core–shell nanorod morphology was corroborated through FESEM and TEM technique. The average length and width were found to be 44 and 16 nm respectively. The specific surface area (SSA), microporous nature and pore volume were investigated through the N2 adsorption isotherm method. The photocatalytic activity of the prepared HAp and HAp/Ta core–shell nanostructured particles was investigated on frequently used dyeing industrial dyes Turq blue GL under UV irradiation. The recorded results evince that the HAp/Ta core–shell nanorods have more catalytic activity than pure HAp and can be used as a nanophotocatalyst for industrial waste water treatment process to curb water pollution and to protect the environment..