**ABSTRACT**

Photodegradation of methyl orange (MO) by hydrothermally grown cerium oxide (CeO2) particles has been investigated. It is observed that formation of oxygen vacancies and the size of the particles increase with increasing growth temperature (230 °C, 250 °C, 270 °C). The sample prepared at 270 °C shows faster photocatalytic degradation of MO (∼90%). Studies on reactive oxygen species generation reveal the unexpected production of singlet oxygen radicals along with super oxide anions. Further, singlet oxygen production was found to increase with the growth temperature. A good correlation between the size of the CeO2 particles, singlet oxygen production and degradation of MO has been found. The production of singlet oxygen may be due to the synergy of oxygen vacancies and size of CeO2 particles which enhance the charge accumulation at the surface of CeO2 particles thus increasing the band bending.