

## Visible and near-infrared light-driven photocatalytic activity of erbium-doped CaTiO<sub>3</sub> system

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### Abstract.

Erbium-doped CaTiO<sub>3</sub> system has been prepared by a microwave-assisted hydrothermal method. The as-obtained photocatalysts were characterized by several techniques such as X-ray powder diffraction (XRD), UV-vis diffuse reflectance spectroscopy (DRS), scanning electron microscopy (SEM) and Brunauer–Emmett–Teller (BET) surface area. From the structural characterization, it can be demonstrated that the presence of Er<sup>3+</sup> ions would cause an increase of the cell volume of the CaTiO<sub>3</sub> crystalline phase. The photocatalytic behavior of the samples was evaluated by means of the degradation of methylene blue under UV-vis-NIR irradiation. The results showed that the presence of Er<sup>3+</sup> ions induces a significant increase of the photocatalytic activity of the system providing higher degradation rates ( $4.54 \times 10^{-5} \text{ s}^{-1}$ ) with respect to pristine CaTiO<sub>3</sub> ( $1.86 \times 10^{-5} \text{ s}^{-1}$ ). However after a heat treatment at 850 °C, the photocatalytic efficiency of the system increased dramatically until values of  $11.9 \times 10^{-5} \text{ s}^{-1}$ . From experiments carried out under vis-NIR irradiation, it was possible to obtain experimental evidence of the presence of up-conversion process from Er<sup>3+</sup> ions.