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**La<sup>3+</sup> and Sm<sup>3+</sup> modified TiO<sub>2</sub> nanoparticles by ultrasound method for enhanced photocatalytic performance**

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TiO<sub>2</sub> nanoparticles modified with lanthanum and samarium by ultrasonic method were synthesized to evaluate the effects of La<sup>3+</sup> and Sm<sup>3+</sup> contents (molar ratios equal 0.03, 0.05, 0.10, 0.15 and 0.30%) in crystal structure and photocatalytic activity. The nanoparticles modified with lanthanum in a molar ratio equal 0.05% or with samarium in a ratio of 0.10% were the most efficient photocatalysts to degrade methylene blue with 97% degradation after 30 min under UV light radiation in aqueous solution. From the characterization analyses (SEM-FEG, TEM, EDS, FTIR, XRD, BET, DRS and particle size distribution) and reactive oxygen species (ROS) kinetic results it is possible to propose that the photocatalytic activity increase is inherent to the defects formation, oxygen vacancies increase and surface –OH enhance, probably due to the formation of Ti–O–La and Ti–O–Sm bonds on the semiconductor surface. The ROS studies also reveal that the singlet oxygen species, originated by hydroxyl and superoxide radicals, are the responsible by photocatalytic capacity of lanthanum doped nanoparticles, followed by •OH species.