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photodegradation of some organic dyes by Nd-doped pyrotitanate nano-sponges as visible light catalysts

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$A_2B_2O_7$ mixed metal oxides are interested for their possible applications. $A_2B_2O_7$ compounds are used as photocatalyst for water splitting [1]. The compounds have an excellent power for fixing matrices of highly active radionuclides from nuclear wastes [2]. They are also used in electrochemical devices due to their ionic conductivity . Besides, $A_2B_2O_7$ compounds are known for their piezo-/ferroelectric properties, used for high temperature devices, and for their attractive photo-luminescent properties when associated with other lanthanide ions [3–4]. $Nd_2Ti_2O_7$ nano-sponges were fabricated via a conventional solid state rout at 800 ºC for 8 h when Nd_2O_3 and TiO_2 were used as raw materials. Crystal structural analyses and purity of the obtained materials were analyzed by *FullProf* program that used profile matching condition with constant scale factor. Field emission scanning electron microscope (FESEM) was applied to study the morphology of the fabricated samples. Ultraviolet – Visible (UV-Vis) spectroscopy showed that the direct optical band gap energies was 3.40 for $Nd_2Ti_2O_7$. The synthesized nanomaterials were used as heterogeneous photocatalysts for the degradation of some water pollutant organic dyes under direct visible (with fluorescent light with 40 W Power) and UVC lights illumination. Malachite green (MG) was used as a typical dye to obtain the optimum photocatalytic degradation conditions. The photocatalytic performance of the as-fabricated samples on the degradation of the pollutant dyes was studied under visible and UVC light irradiations. The optimum conditions were 35 mg of catalyst, 0.05 mL of H_2O_2 and 40 min reaction time. The photocatalytic reaction yield was 97% at the present conditions.

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Keywords: $Ln_2Ti_2O_7$, heterogeneous photocatalyst,Degradation, Malachite Green

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