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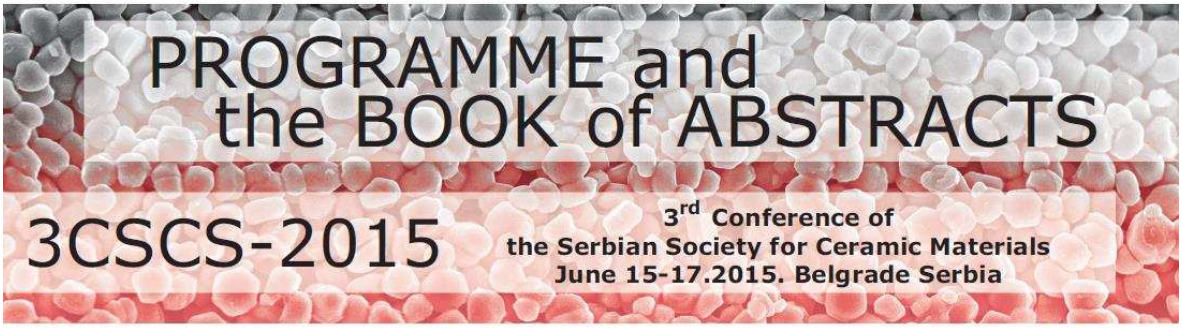

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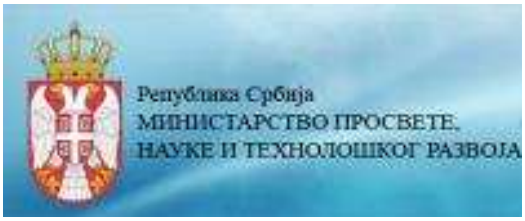

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PHOTOCATALYTIC DEGRADATION OF TEXTILE DYE WITH HYDROTHERMALLY MODIFIED NANOANATASE

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The environmental friendly materials based on titanium oxides are often chosen for the industrial application due to their extraordinary characteristics (biological and chemical stability, good photocatalitic activity, wide band gap and cost-effectiveness). On the other hand, the hydrothermal process in alkaline solutions became a very important treatment in the production of titania and titanate nanostructures. The aim of this work was to investigate how different conditions of hydrothermal treatment could modify the structural, microstructural and photocatalytic properties of starting nanoanatase.

Nanoanatase powder was hydrothermally treated with NaOH solution (c = 5 mol/dm) at different temperatures (T = 110, 135 and 160 °C) and durations (t = 6, 12 and 18 h). The obtained samples were washed out with distilled water, centrifuged and dried. Nine specimens are prepared and labeled as A_{T-t}, where T is temperature of the treatment and t is duration of the treatment. The nanocrystalline samples were characterized by XRD, TEM/SAED and FESEM techniques. The photocatalytic activity was tested on the Reactive Orange 16 (RO16) textile azo dye.

The XRD analysis showed that the hydrothermal treatment caused the formation of a secondary phase ($H_2Ti_2O_5 \cdot H_2O$, PDF 47–0124) besides anatase. This is due to the reaction between anatase and NaOH. The increase of temperature and/or time increases the amount of secondary phase. For example, the specimen A_{110-6} contains about 12 wt.% of $H_2Ti_2O_5 \cdot H_2O$, while the content of this phase amounts about 37 wt.% in A_{135-12}. The average crystallite size of all samples was smaller than 20 nm. This was comfirmed by TEM. The FESEM revealed soft agglomerates created from nanoparticles.

The photocatalytic experiments showed that the presence of secondary phase decreases the photocatalytic activity. For example, A_{110-6} decolorized 35 % of the RO16 dye within 90 minutes, while A_{135-12} degraded only 15% of the same dye in the same time interval.