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An abstract graphic composed of several overlapping, curved green shapes that resemble stylized leaves or petals. The shapes are in various shades of green, from light to medium, and are arranged in a way that creates a sense of depth and movement. They are positioned behind the main title and editor information.

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## TiO<sub>2</sub> Nanocrystals: Synthesis Parameters and Photocatalysis

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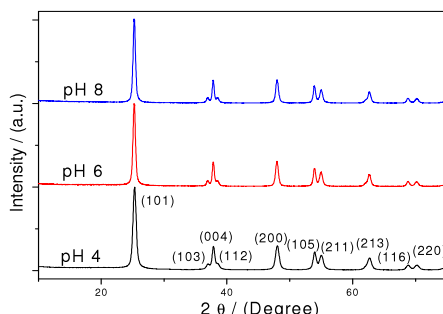
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**Abstract** — Anatase TiO<sub>2</sub> have been synthesized by hydrothermal treatment of amorphous TiO<sub>2</sub> obtained by decomposition of peroxo complex titanium (PCT) and hydrothermal treatment at different pH values (Fig. 1). The samples obtained at pH 6 and 8 show very similar specific surface area (SA), but less than that obtained at pH 4 (Table 1). Photodegradations of Rhodamine B were performed to study the relationship between synthesis pH and degradation rates (Fig 2). The higher pH synthesis, the better is photocatalytic performance. It may be related to surface hydroxylation of the samples, which is a very important characteristic in this kind of experiment.

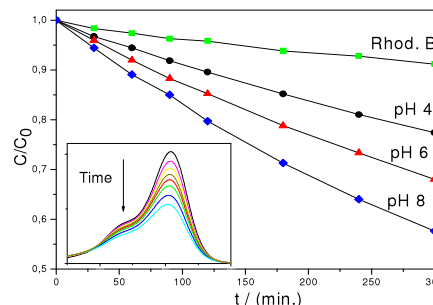
Semiconductor nanocrystals have been widely used in photocatalysis due their high surface area<sup>1</sup>. There is consensus that the most used is the TiO<sub>2</sub>, especially in anatase form. The synthesis method has an important role in the photocatalytic process, because it can generate lattice and surface defects, which are important features in the system. This work aimed to study the influence of pH during the hydrothermal treatment of amorphous precursor to crystallization of nanoparticles in the TiO<sub>2</sub> photoactivity. The PCT has been synthesized by dissolution of metallic Ti in H<sub>2</sub>O<sub>2</sub>/NH<sub>3</sub> solution (3:1). After heating and cooling in an ice bath, the amorphous precursor is formed. To the crystallization, this precursor is dispersed in water and pH value adjusted with HNO<sub>3</sub><sup>2</sup>. X-Ray Diffraction (XRD) analyses were carried out with radiation in 1.5456 Å, corresponding to the Cu Kα emission and scanning at 1,2°/min. Surface areas were determined by N<sub>2</sub> adsorption at 77 K and evaluated by the standard BET procedure. The photodegradation experiments were done under UV illumination and the concentration of residual Rhodamine B was measured at the time through its UV-vis spectra. The sample obtained at pH 8 showed the best photocatalytic performance, followed by those obtained at pH 6 and pH 4. The surface area play an important role in photocatalysis, but in this case, the difference can not be attributed at this parameter, because the sample obtained at pH 4 showed higher SA and worse photocatalytic performance. The difference between the samples may be in an amount of hydroxyl groups on its surface, which is very important in photocatalysis. For the samples that we studied in this work, there aren't effects of crystal growth in photoactivity. Thus, surface hydroxylation can be the unique difference between the samples

**Table 1:** Specific surface area of the as-synthesized nanoparticles and its average diameter

Sample	SA / (m <sup>2</sup> .g <sup>-1</sup> )	Average diameter / (nm)
pH 4	93,3	15,2
pH 6	68,4	20,7
pH 8	66,9	20,4



**Figure 1:** XRD patterns of the as-synthesized samples. (Anatase)



**Figure 2:** Photocatalytic kinetics of Rhod. B degradation

### References

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