# BiOCl: preparation and applications in photocatalytic degradation of phenol.

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## Abstract

Crystal structure of BiOCl obtained by different methods was studied by XRD. BiOCl exhibited higher photocatalytic activity than $TiO_2$-P25.

## Introdução

The study of heterogeneous photocatalysis is an important issue due to its potential applications in environmental pollution purification and energy conversion.[1]

The photocatlytic activity is related to the crystallinity, size and morphology properties. Moreover, these parameters depend on the preparation method.[2] Recently, bismuth oxychloride (BiOCl), as an important V–VI–VII ternary compound, is known to have a layer structure characterized by $[Bi_2O_2]$ slabs interleaved with double slabs of Cl atoms in the tetragonal matlockite structure, which can promote the efficient separation of photoinduced electron–hole pairs.[3]

Here, we describe a very simple method for BiOCl preparation based on chemical precipitation in aqueous solution (p-BOC). L-arginine was used as structure-directing agent, $Bi(NO_3)_3$ and HCl were used as precursor compounds. This reaction mixture was treated by different processes: UV irradiation (UV-BOC), hydrothermal method (H-BOC) and both in two different pH (UV-BOC-H-pH). The structural properties of the obtained materials were characterized by X-ray diffraction, UV-vis diffuse reflectance spectroscopy and BET surface area.

Degradation of solution of phenol and rhodamine-B was used as probe to evaluate the photocatalytic activity of the as-synthesized BiOCl samples.

## Resultados e Discussão

Fig. 1 shows the XRD patterns of the as-prepared BiOCl. The main diffraction peaks were identical to those of tetragonal BiOCl (JCPDS 01-085-0861). The difference in the relative intensity of the diffraction peaks indicates that the UV irradiation and hydrothermal process induce the preferential growth of different facets, especially in the [001] direction and the (110) and (102) planes.

Fig. 2 shows the results of the photocatalysis of phenol by as-prepared BiOCl under 30 min of UV irradiation. Degradation data was determined by phenol concentration and mineralization by the total organic carbon present in the solutions. All of the BiOCl samples showed high photocalytic efficiency in both the degradation and mineralization of phenol.

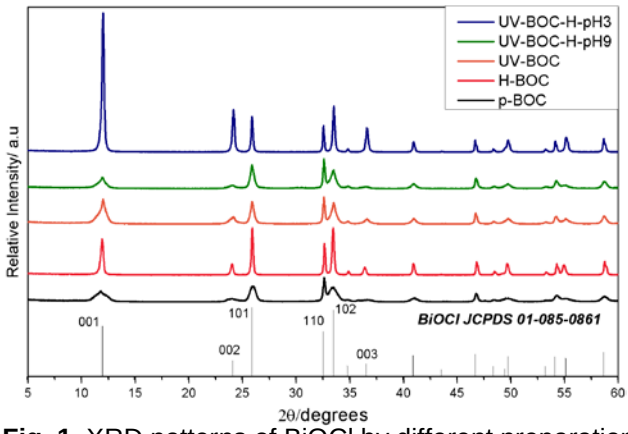


**Fig. 1.** XRD patterns of BiOCl by different preparation methods.

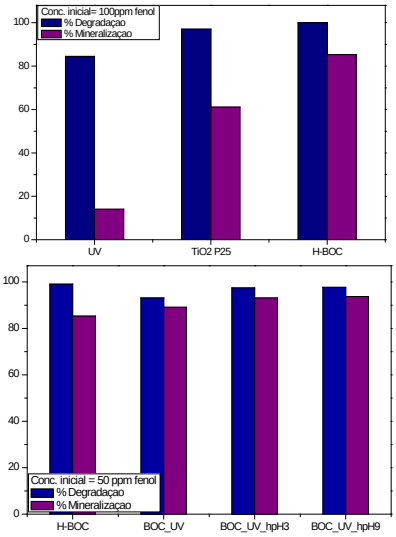


**Fig. 2.** A) Comparison of $TiO_2$ P25, H-BOC and photolysis by UV B) as-prepared BiOCl in degradation of phenol.

## Conclusões

BiOCl was produced by different synthetic pathways, which led to different crystal characterists and photocatalytic efficiencies. Moreover, BiOCl showed better catalytic perfomance than $TiO_2$-P25.

## Agradecimentos

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