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Development of glass and glass-ceramic substrates based on bismuth and vanadium phosphates for photocatalytic applications

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There is currently great concern about the increase in pollutants in water, called emerging pollutants and an alternative to treating organic pollutants is photocatalytic materials. However, these materials are usually difficult to apply because they are obtained as powder, in addition to having photocatalytic activity in the UV region, which is less available from sunlight. This study aims to develop glass and glass-ceramic with crystalline particles based on BiVO4 and BiPO4 for applications as photocatalytic material active with phases under visible light for degradation of pollutants [1]. To evaluate the phosphobismuthate glass and glass ceramic as a potential photocatalytic material, the synthesis of the glass composition of Bi(PO3)3-Bi2O3-Na2O-V2O5 was performed by melt-quenching varying the V2O5 content, and the glass-ceramics were prepared using a heat-treatment with different temperatures. Their characterization was made using Differential Scanning Calorimetry (DSC), x-ray diffraction (XRD), Raman and UV-Vis spectroscopy. It was possible to verify the reduction of Bi2O3 by surface plasmon resonance at 455 nm and the presence of the vanadium ions when the samples were analyzed in UV-vis region. With DSC was possible to observe the increase in the glass transition temperature as V2O5 was introduced into the composition. The Raman spectroscopy showed a gradual depolymerization of phosphate network into pyrophosphate and vanadate-based network. The XRD patter diffraction shown the coexistence of the BiVO4 and BiPO4 phases in glass ceramic samples. Therefore, it was possible obtain glasses with good stability evaluating the changes coming from the addition of vanadium in the composition. Furthermore, to obtention to crystals phase with promising potential as photocatalytic material in visible light region.

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References

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