

## Characterization of copper bismuth oxides synthesized by citrate and solvothermal methods

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**Abstract** – Bismuth and copper Oxides have been synthesized by citrate and solvothermal methods. The effect of pH and the citrate-cations relation on the structural and morphological properties of obtained materials were analyzed. It was found by X ray diffraction a bismuth oxide Kusachiite phase, with tetragonal structure together copper oxide and bismuth oxide, and by scanning electron microscopy (SEM) was found that size and shape of grains are affected by pH of precursor dissolution and citrate/cations ratio.

Since the discovery of superconductivity and magnetic properties in binary metal oxides as copper, bismuth or cobalt oxides[1], the interest to obtaining these compounds has been increased notably in the last years. These systems show electrical characteristics for technological applications in fuel cell, membranes for oxygen separation and ferroelectric materials for solid magnetic memories [2-3]. Ceramic method for synthesis of binaries oxides requires high temperatures and large time (20 h.) of calcination. Citrate and solvothermal methods that have been effective in synthesis of metal oxides with lanthanides elements [5] can be alternatives routes for synthesis of bismuth-copper oxides.

In this work, Kusachiite phase with copper oxide and bismuth oxide was synthesized by citrate and solvothermal methods and characterized by powder X-ray diffraction (XRD) and scanning electron microscopy (SEM). In citrate method, a study of the influence of pH and effect of citrate/cations ratio on the dissolution stability and structural and morphological properties of obtained oxides was carried out. At pH 6-8 range and citrate/cations ratio equal at 4, we found a total dissolution of chemical species and good stability of dissolution. Citrate method allowed reduces the calcination temperature and time to 973 K during 1 hour respectively; these are lower than conditions required in ceramic route. SEM images show the influence of pH of precursor dissolution on size and shape of the grains (Fig No 1).

Solvothermal method allows the formation of mesostructured precursors with copper oxide and bismuth oxide mixture with poor crystallinity at 473 K during 72 hours, after calcination at 973 K, oxides showed an increase in their crystallinity.

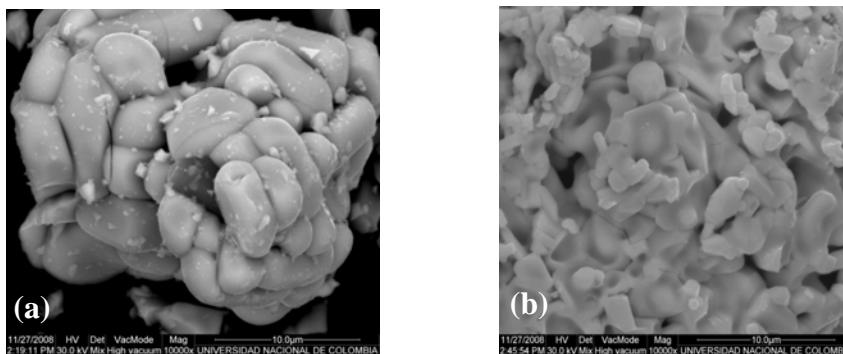


Figure 1. SEM images of  $\text{Bi}_2\text{CuO}_4$ , calcinated at 973 K, (a) pH 1 and (b) pH 6.

### References

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