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Synthesis by hydrogen reduction and characterization of nanoparticles content CuNiCo alloy

Metals and alloys are of great technological interest which may even increase if they are nanostructured and, then, it can be found in the literature many proposed chemical synthesis methodologies in order obtain different kind of nanoparticles content materials. Under this subject the main objectives of this work were to obtain a CuNiCo alloy by an alternative procedure, capable of generating nanostructured grains, followed by its preliminary characterization. The first part was carried out by dividing the process into two steps: the first one was the thermal decomposition of a nitrate solution [$\text{Cu}(\text{NO}_3)_2$, $\text{Ni}(\text{NO}_3)_2$ and $\text{Co}(\text{NO}_3)_3$] aiming to obtain a homogeneous co-formed metal oxides mixture. In the second step, these oxides are heated up to a desired temperature and kept in a reductive flow of hydrogen, leaving the CuNiCo alloy as final product. The applied reduction temperatures were in the range between 300°C and 900°C. The materials obtained after each step were characterized by Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray Detector (EDS). As result of the first step, it was found that oxygen, Cu, Ni and Co were, as desired, homogeneously distributed. The after reduction

obtained material present different shape and particle size, depending on the applied reducing temperatures, as illustrated in Figure 1 to 300°C and 900°C. The more circular and greater size observed at 900°C confirms an increased sintering occurrence at higher temperature and the EDS results indicate the expected composition for Co, Ni and Cu. This alloy was also observed by Transmission Electron Microscopy (TEM) and have shown the presence of particles with spherical morphology and a homogeneous distribution of the elements, which are sharing the same crystal structure. Also, it was noted the presence of particles smaller than 100 nm in the CuNiCo alloy.

Speaker Biography

Eduardo A Brocchi is a Metallurgical Engineer from Rio de Janeiro, Brazil. He has completed his PhD at the Imperial College of Science, Technology and Medicine, London, UK, in 1983. Since then, he has been teaching, at the Pontifical Catholic University of Rio de Janeiro (PUC-Rio), Brazil, and, also, carrying out research in the field of high temperature processes dedicated to extractive metallurgy and materials synthesis. He has participated in the publication of more than two hundred articles in proceeding and periodicals as well as has been awarded some prizes. Brocchi became Titular Professor of the University (PUC-Rio) in 2015 and, at present, is the Head of the Department of Chemical and Materials Engineering.

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