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Synthesis and magnetic characterization of ni nanoparticles in ceramic matrix

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The production of nanoparticles by exsolution is a technique that has been extensively researched and improved recently. Exsolved particles have superior properties when compared to deposited particles. The method of exsolution consists in the reduction of previously solubilized ions in a matrix, giving rise to particles strongly attached to the substrate. Materials with compositions (La1-xSrx)z(Cr1-yNiy)O3-? (x and y = 0%, 5%, 10%, 15% and 20%, z = 100% and 80%) were synthesized using the polymerization of complexes technique. The resin produced in the synthesis process was analyzed using thermal analysis and the calcination temperature was determined to be 900 ° C. The X-ray diffraction technique was used to characterize structures and identify the present phases. All samples were reduced to create nanoparticles of metallic nickel by exsolution. Magnetic analysis was conducted to determine the magnetic behavior of the produced materials. Non-stoichiometric materials were synthesized to verify the influence of different stoichiometry in the exsolution process. Non-stoichiometric A site impaired the solubilization of Ni and Sr in the lanthanum chromite structure. All samples with dopants showed a decrease in the temperature of Neel of the lanthanum chromite. However, the reduction treatment caused an increase in the Neel temperature when compared to the oxidized samples. This is indicative of the decrease in nickel concentration in solid solution, a result consistent with the exsolution mechanism. Using the measurements of magnetism, it was possible to verify the mechanism of exsolution and mass fraction of metallic nickel for each sample. Using electron microscopy techniques, it was possible to detect the presence of nanoparticles after the reduction treatment with a diameter of approximately 20 nm. When performing a local chemical analysis using a transmission electron microscope, it was possible to verify that the particles in question are of metallic nickel.