A new technique to determine catalysts amounts with ferromagnetic behaviour

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Metallic nanoparticles can be applied at several different areas, from magnetic contrast to fuel production. Nickel is already applied in breaking H-C bounds to the produce H_2 for application in SOFC. The miniaturization of the catalyst into nanoparticles can enhance thermal stability and performance. Nowadays, there are some difficulties related to the synthesis, stabilization and characterization of the nanometric system. A new technique to obtain highly disperse nanoparticles consist in the exsolution of previously solubilized ions in a ceramic matrix [1]. Exsolved nanoparticles show higher stability and better catalytic performance, if compared with only deposited particles. The quantization of nanoparticles in the material, using XRD, SEM, TEM or EDS analyses, is not a simple task due limitations of each technic. Magnetic measurements are quick and can provide a precise amount of ferromagnetic particles present in the sample. To demonstrate this technique, samples with compositions $(La_{1-x}Sr_x)(Cr_{1-y}Ni_y)O_3$ (x and y = 0, 0.1 and 0.2) were synthesized by complex polymerization method. The morphology of the obtained powder was observed with SEM and TEM. The samples were reduced at 800 °C and 900 °C in pure hydrogen, in order to create metallic nickel nanoparticles by exsolution. Magnetic analyses were conducted with a SQUID/VSM. Reduced samples show a coupling between the ferromagnetic and antiferromagnetic behaviour and a higher temperature of Neel, when compared with thermally treated air. Using as magnetic measurements results was possible to determine higher amounts of Ni, if compared with values obtain from Rietveld refinement.

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