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The influence of synthesis parameters on textural properties of modified Ni-based catalysts supported on magnesia for production of reducing atmosphere

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Reducing gas atmosphere containing CO and H_2 as processing gasses is commonly used in the metal processing industry for heat treatment of special metals. For the production of reducing atmosphere conventionally are employed nickel catalysts on various ceramic supports. Since the process takes place at high temperature, thermal stability and textural properties of catalysts are of particular interest. In this work magnesia supported nickel catalysts were synthesized. The catalyst synthesis consisted of single or successive impregnations with nitrate precursor salts of nickel and modifiers (Al, Ca and Mg), followed by thermal catalyst activation. Nickel:-modifier molar ratio was 10:1.The solid to liquid mass ratio was 1:3. The concentration of Ni in impregnation solution varied from 1.0 to 3.0 moldm^{-3}. Mercury intrusion porosimetry was used for textural characterization since the synthesized catalysts were predominantly macroporous. The impregnation led to decrease of total pore volume, broadening and shifting of pore size distribution curve towards smaller pores. These changes were enhanced with the increase of initial concentration of Ni solution and number of successive impregnations as well as the nature of modifier. The Ni-catalyst modified with Al showed the best textural properties.

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Annealed nanopowder $GdVO_4:Sm^{3+}$ prepared by solution combustion synthesis

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The gadolinium vanadate doped with samarium ($GdVO_4:Sm^{3+}$) nanopowder was prepared by the solution combustion synthesis (SCS) method. After synthesis, in order to achieve the full crystallinity, the material was annealed in air atmosphere at 1300 °C. Phase identification in the post-annealed powder samples were performed by X-ray diffraction, and morphology was investigated by high resolution scanning electron microscope (SEM). Photoluminescence characterization including excitation and emission spectra and lifetime analysis has been done using tunable laser optical parametric oscillator excitation and streak camera. Several strong emission

bands in Sm^{3+} emission spectrum were observed, located at 563 nm ($^4G_{5/2} - {}^6H_{5/2}$), 600 nm ($^4G_{5/2} - {}^6H_{7/2}$), and 644 (653) nm ($^4G_{5/2} - {}^6H_{9/2}$), respectively. The weak emission at 700-710 nm ($^4G_{5/2} - {}^6H_{11/2}$) was also observed by detection system.

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Chitosan-montmorillonite bionanocomposite as textile dyes adsorbent

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The removal of color dyes from wastewater before they are released in natural waters is important since some dyes are highly toxic for environment. Although several traditional chemical and biological processes exist for dye removal, application of these techniques has been restricted due to the essentially non-biodegradable nature of dyes. Some modified clays, may play a role of low cost adsorbents suitable for dye removal. Since natural clays are ineffective as adsorbents for organic compounds it is necessary to modify their surface. Chitosan-clay nanocomposites are promising materials with organic-inorganic hybrid interfaces. These materials contain a biopolymer chitosan and they represent a green alternative to conventional organoclays in their applications, i.e. as adsorbents. The intercalation of chitosan into smectite clay can result in monolayer and/or bilayer arrangements. When bilayer structures are formed some free $-NH_2$ groups present in the interlamellar region are making these materials suitable for adsorption of anionic species, i.e. anionic textile dyes. In this work chitosan-clay nanocomposite was synthesized using Na^+-enriched smecite clay and characterized using physical-chemical methods. In this manner the bionanocomposite with bilayered intercalation of chitosan chain was obtained and tested as adsorbent. The adsorption of anionic dyes Acid Orange 10 (AO10), Acid Yellow 99 (AY99) and Reactive Black 5 (RB5) has been studied by varying the different adsorbate concentrations, temperature and shaking time. The concentration of commercial textile dyes was analyzed before and after adsorption test using Thermo Electron Nicolet Evolution 500 UV-VIS spectrophotometer in wavelength range from 250 – 800 nm.

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MAGNETOIMPEDANCE EFFECT IN FINEMET MICROWIRES FOR SENSOR APPLICATION

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In this study magnetoimpedance (MI) effect of FINEMET alloy microwires for magnetic sensor application is presented. Amorphous magnetic wires were produced from arc-melted ingots of master prealloys of nominal composition $Fe_{73}Cu_1Nb_3Si_{13.5}B_{9.5}$ by in-rotating water spinning