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Nanostructure of Gamma-Alumina Prepared by a Modified Sol-Gel Technique

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Abstract : Nanoporous g-Al₂O₃samples were synthesized via a sol-gel technique, introducing changes in the Yoldas´ method. The aim of the work was to achieve an effective control of the nanostructure properties and morphology of the final g-Al₂O₃. The influence of the reagent temperature during the hydrolysis was evaluated in case of water at 5 ºC and 98 ºC, and alkoxide at -18 ºC and room temperature. Sol-gel transitions were performed at 120 ºC and room temperature. All g-Al₂O₃samples were characterized by X-ray diffraction, nitrogen adsorption and thermal analysis. Our results showed that temperature of both water and alkoxide has not much influence on the nanostructure of the final g-Al₂O₃, thus giving a structure very similar to that of samples obtained by the reference method as long as the reaction temperature above 75 ºC is reached soon enough. XRD characterization showed diffraction patterns corresponding to g-Al₂O₃for all samples. Also BET specific area values (253-280 m²/g) were similar to those obtained by Yoldas’s original method. The temperature of the sol-gel transition does not affect the resulting sample structure, and crystalline boehmite particles were identified in all dried gels. We analyzed the reproducibility of the samples’ structure by preparing different samples under identical conditions; we found that performing the sol-gel transition at 120 ºC favors the production of more reproducible samples and also reduces significantly the time of the sol-gel reaction.

Keywords : nanostructure alumina, boehmite, sol-gel technique, N2 adsorption/desorption isotherm, pore size distribution, BET area.
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