The Serbian Society for Ceramic Materials
Institute for Multidisciplinary Research (IMSI), University of Belgrade
Institute of Physics, University of Belgrade
Center of Excellence for the Synthesis, Processing and Characterization of Materials for use in Extreme Conditions "CEXTREME LAB" - Institute of Nuclear Sciences "Vinča", University of Belgrade
Faculty of Mechanical Engineering, University of Belgrade
Center for Green Technologies, Institute for Multidisciplinary Research, University of Belgrade
Faculty of Technology and Metallurgy, University of Belgrade
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SYNTHESIS AND APPLICATION OF SILICA PARTICLES FOR THE REMOVAL OF HEAVY METALS AND PESTICIDE RESIDUES FROM AQUEOUS SOLUTIONS

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In this study, the adsorption behavior of silica adsorbents with different morphology and porosity has been examined in order to evaluate their use for the purification of wastewaters containing toxic environmental chemicals such as heavy metals and pesticide residues. Three different types of silica particles were investigated: (i) microporous silica core particles prepared by the hydrolysis and condensation of tetraethylorthosilicate (TEOS), (ii) mesoporous silica particles generated by the neutralization of highly basic sodium silicate solution and (iii) silica core-shell particles composed of mesoporous silica layers around dense cores. Monodispersed spherical silica particles produced from TEOS have a microporous structure but the lowest adsorption efficiency and adsorption capacity of both heavy metals and pesticides. Polydispersed silica particles of irregular shape prepared from highly basic sodium silicate solution exhibit a mesoporous structure and high efficiency for the removal of heavy metals and pesticides from aqueous solutions. Monodispersed core-shell particles composed of a microporous core and a mesoporous shell also have high adsorption efficiencies in both combinations. Moreover, silica particles can be easily functionalized with ferrite nanoparticles, which allow the magnetic separation of silica adsorbents from aqueous solutions.