

Article

Use of By-Products from Gasification and Carbonization from Polymeric Residues and Biomass for Application in Liquid Phase Adsorption

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Abstract: The search for strategies that contribute to circular economy, based on the valorization of by-products of the most diverse industries and processes, is one of the main environmental objectives at present. This study aims to evaluate the possibility of valorizing by-products from the gasification and carbonization of polymeric residues and biomass of natural origin through their application in adsorption processes. The selected residues and carbon by-products resulting from thermochemical conversion by the gasification and carbonization processes, after their physical and chemical characterization, presented improved structural and chemical properties which allow their application in adsorption processes. The characterization of the materials and samples prepared in this work involved a variety of analytical techniques, such as thermogravimetric analysis, polarized attenuated Fourier transform infrared spectroscopy, X-ray fluorescence, ultimate analysis, and nitrogen adsorption at 77 K. It was possible to observe that the material has between 40% and 50% volatile matter, and when carbonized, these values decrease to the range of 5% and 10%. The BET surface area analysis of these chars shows values between 100 and 400 m²g⁻¹. For the chemically activated samples and for the phenol molecule, the samples with the best results are those that were prepared using olive prunings as a precursor. For the physically activated samples and also for phenol adsorption, the samples that showed the most potential were the ones prepared via air activation. Regarding the gasified samples, the best results were achieved with the samples without the incorporation of waste-derived fuel.

Keywords: circular economy; gasification; carbonization; chars; adsorption; biomass