Surface Characterization of Polymer-Based Carbon Adsorbents

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Recent advancements in carbon technologies allow the use of spherical carbon molecular sieve (CMS) particles in packed bed systems and in coated devices for analytical applications. Textural and surface properties of Supelco® carbons provide capacity and specificity for gas and liquid separations. Spherical, high purity carbon adsorbents were prepared from porous polymers. The carbon particles were characterized using N_2 and CO_2 adsorption isotherms. Surface area was calculated from BET adsorption isotherms, and pore size was calculated using non-local Density Functional Theory (NLDFT) models. The surface chemistry of the carbons was characterized using TGA-MS. Dynamic adsorption properties of the carbons were determined using chromatographic analysis in packed beds. Carbons were packed in stainless steel columns 50 mm X 10 mm ID, the carbons were in the 180-800 µm size range (20/45 and 60/80 mesh) and 400 to 1200 m^2/g of BET surface area. Solutions of benzylamine, benzoic acid, and toluene 0.4-0.8 g/L were passed through the cartridge at 20 ml/min until the solution breakthrough the column. The analytes were tracked using a UV detector at 254 nm. Acid and basic carbons showed longer retention volumes than hydrophobic carbons and commercially available activated carbons. For carbons with similar chemistry, carbons with larger surface area showed larger retention volumes.