Adsorption and Separation of Hydrocarbons by Activated Carbons with Controlled Pore Structure

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Carbon molecular sieves (CMS) belong to a family of Activated Carbons (AC). CMS can be obtained by various manufacturing processes that can not only modify but also control the pore structure. The narrowing of the pores to less than 10Å increases diffusion speed of smaller molecules compared to larger ones. This enables rapid gas separation due to differences in molecules sizes.[1] The ability to tune pore sizes of CMS in order to obtain desired pore size distribution is critical for effective separating of molecules of interest and increase the sieving capability of AC. The size of access pores in CMS can be tailored by optimizing manufacturing conditions. By selecting the appropriate adsorbent that allows entry of those molecules small enough to pass into the pore system, the maximum adsorbate diameter can be found. Hence, the probe molecule characterization of the CMS can provide valuable information about molecular sieving capabilities of the carbon.

This work highlights a novel experimental method of the probe molecule characterization for determining vapour adsorption isotherms on AC with controlled pore sizes and diffusion kinetics. Adsorption data and kinetics obtained using condensable vapours from room to high temperatures as well as data for competitive adsorption of two probe molecules on different AC and evaluation of their access pore size will be presented.

References

1. Laredo, G.C., *et al.* (2008). *Energy & Fuels* 22(4), 2641-2648.