Application of Silica/Carbon Nanotube Nanocomposite as an Adsorbent in Separation (Gas Chromatography)

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The process of separation of the gaseous mixture is extremely important, especially in gas and petroleum industry. For this purpose, it is needed to use the adsorbent phase. Silica gel is widely used as an adsorbent in gas separation by pressure swing adsorption (PSA) and also as a stationary phase in gas and liquid chromatography. However, silica gel (SiO2) is a polar adsorbent which is mainly used to separate polar gases like (CO, CO2) and polar compounds. On the other hand, the carbon materials such as activated carbon recently carbon nano tube (CNTs) have been widely used for separation of nonpolar materials. In particular, the exceptional mechanical properties of CNTs [1], combined with their low density [2], offer scope for the development of nanotube reinforced composite materials. In this work, a CNT-Silica gel nanocomposite was prepared by the sol-gel process [4]. The sol-gel process is a process for making glass/ceramic materials. The sol-gel process involves the transition of a system from a liquid (the colloid “sol”) phase into a solid (the “gel”), and it was used as an stationary phase in gas chromatography for separate gases having polar and nonpolar properties (CO, CO2, N2, O2, CH4) which used to be separated in two different columns by different adsorbents. Now we can do the same work in a single column. The results can be use not only for fabrication of new stationary phase in chromatography and also in separation of gas mixture in pressure swing adsorption (PSA) column in the industrial scale.

Adsorption isotherm (silica gel)

References