https://link.springer.com/article/10.1007/s42823-019-00086-0

High porosity activated carbon synthesis using asphaltene particles

Muwafaq Ayesh Rabeea,
Tahseen Ali Zaidan,
Abdalkareem Hamad Ayfan &
Atyaf A. Younis

Abstract

The study aims to use asphaltene particles (As) extracted from natural bitumen to synthesize activated carbon (ACAs). The asphaltene particles were mixed with a fixed weight of potassium hydroxide (KOH) as an activating agent, preheated to 600 °C, and then treated with 15% hydrofluoric acid (HF). The methylene blue (MB) 20 mg/l was used to determine the adsorption capacity of ACAs and reactivated carbon (RACAs). The morphology of ACAs and its components were characterized using scanning electron microscopy–energy dispersive X-ray (SEM–EDX) and Fourier-transform infrared spectroscopy (FTIR). The study included the application of adsorption isotherms Freundlich and Langmuir on the experimental data of the studied systems. The yield of ACAs was 92% of the raw material. The activated carbon displayed high adsorption capacity and can be reprocessed after reactivation using microwave radiation. The active surface area of ACAs is found to be 970 m2/g. The effectiveness and adsorption ability of ACAs and RACAs, as proven by its adsorption capacity (218.15 and 217.907 mg/g) for MB, demonstrate that ACAs and RACAs have a large external surface area and an extensive array of pores. The ACAs are most sensitive at 30 °C and neutral pH. The results also showed that the isotherms have a good fit to the experimented data.

Keyword

Asphaltene · Activated carbon · Reactivation · Adsorption isotherm · Microwave