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In-situ measurement of Auramine-O adsorption on macroporous adsorption resins at low temperature using fiber-optic sensing

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ABSTRACT

Liquid-phase adsorption (LPA) at low temperature (e.g., 258 K) based on fiber-optic sensing was developed. Auramine-O (AO) and macroporous adsorption resins (MARs) were selected as adsorbate and adsorbent, respectively. A thermostatic adsorption vessel was designed and connected to a condensing circulating pump to enable the measurement of LPA at low temperatures. The adsorption measurement vessel contained a conical flask, a magnetic stirrer, a nylon adsorption bag, and a fiber-optic probe. Here, the adsorption bag enabled *in-situ* light absorption measurement by eliminating the interference of sorbent particles with the aid of the membrane. Adsorption conditions such as solvent, sorbent, and temperature were optimized. At a relative low-temperature range from 258 to 283 K, the adsorption capacity of HPD300 for AO increases with temperature, which was a spontaneous, endothermic adsorption process. On the contrary, at near room temperature region from 283 to 308 K, adsorption capacity decreases with temperature and it's a favorable, exothermic adsorption process. The AO adsorption process fits the Freundlich model better than the Langmuir model under the system at all temperatures. Maximum adsorption of auramine-O on HPD300 resin was obtained at 283 K. This approach could provide facile and accurate measurement of adsorption in a wide range of temperatures.

Keywords: Low temperature; Liquid-phase adsorption; Auramine-O; Fiber-optic sensing; *In-situ* measurement

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