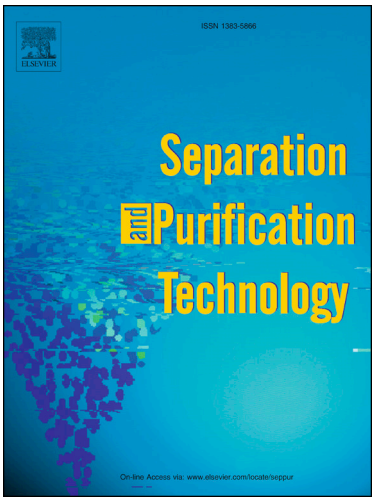

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Capacitive deionization of chloride ions by activated carbon using a three-dimensional electrode reactor

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Abstract: A three-dimensional electrode reactor was introduced into capacitive deionization(CDI). Electrosorption kinetic and the influence of experimental parameters on removal of chloride ion from aqueous solutions at various anode potentials (0.3-1.2V), pH (1-10), ionic strengths (0.028- 3.028 M), thickness of packed-bed (3.5 & 5 cm), temperatures (298-323 K) and circulation velocities (75-168 ml min^{-1}) on granular activated carbon(GAC) were studied in the three-dimensional electrode reactor. Electrosorption of chloride ion was found to be pH dependent. The result showed that the electrosorption capacity of the chloride ion increased with increasing anode potential, but decreased with increasing ionic strength, thickness of packed-bed and temperature. The value of activation energy of electrosorption was found to reduce compared to adsorption. This may be the main reason that anode potential enhanced significantly adsorption capacity. Batch kinetic data from experimental investigations have been described by external mass transfer and intraparticle diffusion models. It was found that intraparticle diffusion and adsorption had rate limiting effects on the electrosorption process.

Keywords: Capacitive deionization; Electrosorption; Three-dimensional electrode; External diffusion; Intraparticle diffusion; Activation energy