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Ion Exchange Treatment of Saline Solutions using Lanxess S108H Strong Acid Cation Resin

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Abstract

Common to many types of water and wastewater is the presence of sodium ions which can be removed by desalination technologies, such as reverse osmosis and ion exchange. The focus of this investigation was ion exchange as it potentially offered several advantages compared to competing methods. The equilibrium and column behaviour of a strong acid cation (SAC) resin was examined for the removal of sodium ions from aqueous sodium chloride solutions of varying normality as well as a coal seam gas water sample. The influence of the bottle-point method to generate the sorption isotherms was evaluated and data interpreted with the Langmuir Vageler, Competitive Langmuir, Freundlich, and Dubinin-Astakhov models. With the constant concentration bottle point method, the predicted maximum exchange levels of sodium ions on the resin ranged from 61.7 to 67.5 g Na/kg resin. The general trend was that the lower the initial concentration of sodium ions in the solution, the lower the maximum capacity of the resin for sodium ions. In contrast, the constant mass bottle point method was found to be problematic in that the isotherm profiles may not be complete, if experimental parameters were not chosen carefully. Column studies supported the observations of the equilibrium studies, with maximum sodium loading of *ca.* 62.9 g Na/kg resin measured, which was in excellent agreement with the predictions of the data from the constant concentration bottle point method. Equilibria