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Polyampholytic Resins: Advances in Ion Exchanging Properties

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Abstract : Ion exchange (IEX) resins are commonly available as cationic or anionic resins but not as polyampholytic resins. This is probably because sequential acid and base washing cannot produce complete regeneration of polyampholytic resins with chemically attached anionic and cationic groups in close proximity. The 'Sirotherm' process, developed by the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Melbourne, Australia was originally based on the use of a physical mixture of weakly basic (WB) and weakly acidic (WA) ion-exchange resin beads. These resins were regenerated thermally and they were capable of removing salts from an aqueous solution at higher temperatures compared to the salt sorbed at ambient temperatures with a significant reduction of the sorption capacity with increasing temperature. A new process for the efficient regeneration of mixed bead resins using ammonium bicarbonate with heat was studied recently and this chemical/thermal regeneration technique has the capability for completely regenerating polyampholytic resins. Even so, the low IEX capacities of polyampholytic resins restrict their commercial applications. Recently, we have established another novel process for increasing the IEX capacity of a typical polyampholytic resin. In this paper we will discuss the chemical/thermal regeneration of a polyampholytic (WA/WB) resin and a novel process for enhancing its ion exchange capacity, by increasing its internal pore area. We also show how effective this method is for completely recycled regeneration, with the potential of substantially reducing chemical waste.

Keywords : capacity, ion exchange, polyampholytic resin, regeneration
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