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MnO_2 STRUCTURE INDUCED SURFACE CHARGE EFFECT ON THE PERFORMANCE OF CAPACITIVE DEIONIZATION IN DIFFERENT PH

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MnO_2 has been widely applied as active additives in capacitive deionization (CDI) but there is no unambiguous conclusion made yet regarding which MnO_2 phase would lead the highest CDI performance. To answer this question, different MnO_2 phases (α,β,γ,and δ phase) were synthesized and associated to activated carbon supports to examine their CDI performances (percentage difference in the conductivity) in different pH by the simple batch mode method. Results collected from alkalimetric-acidimetric titration revealed that the deionization efficiency decreased proportionally with increasing surface charge (degree of ionization of surface hydroxyl groups) of MnO_2 additives. Importantly, this correlation was independent to the pH and the MnO_2 phases. Following electric impedance spectroscopy analyses clearly indicated this correlation is realized as a fact that a highly charged surface would induce a high resistance in the diffusion layer and hence conversely inhibit the access of foreign ions in CDI process. As a result, applied bias in CDI process is mainly to allow foreign ions to overcome this resistance, instead of to attract and accommodate them. Based on our results, the discrepancy in CDI efficiency resulting from different MnO_2 phases might be simply attributed to structure induced surface charge effect where different MnO_2 phases possess their unique surface charge pattern.

Biography

Su Xu is an instructor of Environmental engineering in Xiamen University of Technology and got her Dipl.-Ing. degree from TU-Cottbus Germany. Now she is a PhD student of National Tsing Hua University. Her research interests environmental engineering, energy technique, separation techniques.

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