عنوان مقاله:

An experimental study on the effect of composite electrode on the membrane- assisted electrode in CDI and MCDI processes towards nitrate ion selectivity

محل انتشار:

فصلنامه پیشرفت ها در فناوری محیط زیست, دوره 8, شماره 3 (سال: 1401)

تعداد صفحات اصل مقاله: 17

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خلاصه مقاله:

The removal of nitrate concentrations above international drinking water standards is a prominent task of governments. In this regard, various technologies such as reverse osmosis, biological denitrification, electrodialysis, and capacitive deionization (CDI) as an electrochemical approach have been used for nitrate removal from water. In the present research study, a novel composite electrode named E۲ was synthesized and used to improve the efficiency of the membrane capacitive deionization (MCDI) process for increasing the electrosorption capacity of nitrate from water. E۱ as a based electrode composed of activated carbon (AC), PVDF, and E۲ as an optimal electrode containing (AC), PVDF, ZrO۲, and PANi -ES were utilized. The morphology and structure of the composite electrode were determined using field emission scanning electron microscopy (FESEM), Brunauer–Emmett–Teller (BET), Fourier-transform infrared spectroscopy (TEM), X-ray diffraction (XRD), and energy-dispersive X-ray spectroscopy (EDAX) techniques. Also, the cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) methods were applied to investigate the electrochemical behavior of the electrodes. In the MCDI process with the presence of the E۲ electrode, the amounts of separated nitrate ion and its adsorption efficiency were ۷.۵۱ mg/g and ۸۱.۶%, respectively; this demonstrated that the capacity of the adsorbed nitrate ion by the MCDI process was ۳۰.۳۴% higher than the CDI process. On the other hand, the E۲ electrode, compared to the E۱ electrode, ameliorated the performance by almost ۵۰% of the amount of adsorbed nitrate ion and also ion adsorption efficiency during the CDI .and MCDI processes

کلمات کلیدی:

Selective nitrate removal, Electrosorption, Composite electrode, Membrane capacitive deionization