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# Characteristic analysis of a diaphragm electrolysis reactor with different electrode materials and concentrated degrees of brine

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**ABSTRACT**

The current demand for drinking water is rapidly exceeding the water supply. Desalination is one effective way to solve the worldwide water shortage. However, disposal of concentrated brine depends on discharge through oceans and evaporation ponds. Electrolysis is one of the solutions to address discharge of concentrated brine. Electrolysis is mainly categorized into mercury, diaphragm, and membrane types. Diaphragm type electrolysis was adopted here and was applied to a 200 mL reactor. A 10 μm pore size filter was used, and the head was <8 cm. The data in this study were collected to evaluate NaOH concentration, $Cl^-$ removal, and current efficiency (CE) by changing the concentrated degree and electrode material. When changing the concentrated brine to degrees of raw, triple, and quintuple, NaOH concentration was 1.6%, 2.3%, and 2.8% and $Cl^-$ removal was 75%, 39%, and 28%, respectively. These tendencies were caused by decreasing internal resistance. CE was inversely proportional to temperature, caused by ion quantity. Because iridium has a lower electrical resistivity than ruthenium, electrical resistivity has a decisive effect on electricity consumption. When highly concentrated brine was used in electrolysis, around 3% NaOH alkaline water was produced. Because of the thermal resistance of reactor in acrylic, the maximum temperature of operating reactor was until 90°C. Current density can be higher in the reactor if brine concentration is higher. The right options for catalyst material selection depend on the designated purpose of the catalyst material.

*Keywords:* Chlor-alkali process; Concentrated brine; Electrolysis; Diaphragm cell

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