



MgCl₂ and MgSO₄ as draw agents in forward osmosis process for East Baghdad oilfield produced water treatment

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ABSTRACT

This study investigated a novel application of forward osmosis using different types of draw solutions for oilfield produced water treatment from the East Baghdad oilfield affiliated to the Midland Oil Company (Iraq). Magnesium chloride (MgCl₂) and magnesium sulfate (MgSO₄) were used as draw solutions in forward osmosis process to evaluate their effectiveness. Experiments were conducted in a laboratory scale forward osmosis system with cellulose triacetate hollow fiber membrane. In this work, sodium chloride solution was used as a feed solution with a concentration of 76 g/L (same concentration as the East Baghdad oilfield produced water) and the applied external pressure on the feed solution side was 2 bar. The impact of draw solution (DS) concentration (2.3 and 3 M) and mode of operation (batch mode and continuous mode) on the forward osmosis performance for produced water treatment were investigated on flux, recovery, feed solution concentration, and reverse salt flux. The recovery and feed solution concentration increased with increasing draw solution concentration and time, while the flux increased with increasing the draw solution concentration and decreased with time. The continuous mode of operation ($t = 8$ h) is more effective than the osmotic dilution mode ($t = 12$ h) in concentrating the feed solution. The result showed that in continuous mode with a draw solution concentration of 3 M, the feed solution was concentrated to 112.77 g/L with MgCl₂ as DS at which the recovery was 29.97%, while it was concentrated to 84.89 g/L with a recovery of 10.54% with MgSO₄ as DS.

Keywords: Forward osmosis; Magnesium chloride (MgCl₂); Magnesium sulfate (MgSO₄); Iraqi oilfield produced water

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