

## A review on sources, types, mechanisms, characteristics, impacts and control strategies of fouling in RO membrane systems

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### ABSTRACT

Reverse osmosis (RO) is the largest promising and popular water treatment technology with a distinguished rank at the top of the list compared with other water treatment methods. Unfortunately, RO technology is adversely impacted by fouling, the most crippling obstacle to its spread use in the water treatment industry. Membrane fouling is known to be the process of undesirable matter accumulation on the membrane surface or inside its pores resulting in the reduction of the membrane permeates flux as well as its overall efficiency. This article comprehensively illustrates fouling sources, impacts, influencing factors, characterization, types of fouling, formation mechanisms, and nature. Furthermore, membrane cleaning strategies, fouling control, prevention, and mitigation are also covered. The article emphasized that membrane fouling is an inevitable issue of RO technology and it must be controlled, minimized and if possible overcome. Despite the big efforts made by researchers towards doing so, they need to further understand the fouling issue and strategies to control and mitigate it is consequently in need of further research and investigation. Additionally, novel membrane materials and innovative manufacturing processes should also be adopted to reduce the fouling potential and to provide radical solutions for fouling. Advantageously, this review has the following distinguished merits (1) comprehensive coverage of RO membrane fouling applied in the desalination industry including types and sources, influencing factors, cleaning methods, and prevention and control strategies, (2) constructing a systematic historical referenced-based record of literature fully dedicated for RO membrane fouling applied for desalination industry, and (3) Selectively indicating recent progress and achievements towards understanding and mitigating membrane fouling effects.

**Keywords:** Reverse osmosis; Treatment; Fouling; Cleaning strategies; Fouling control; Novel membrane materials; Desalination industry

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