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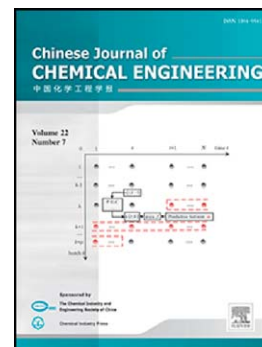
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# Recent developments in nanofiltration membranes based on nanomaterials<sup>☆</sup>

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**Abstract:** Nanofiltration membranes are the core elements for nanofiltration process. The chemical structures and physical properties of nanofiltration membranes determine water permeability, solute selectivity, mechanical/thermal stability, and antifouling properties, which greatly influence the separation efficiency and operation cost in nanofiltration applications. In recent years, a great progress has been made in the development of high performance nanofiltration membranes based on nanomaterials. Considering the increasing interest in this field, this paper reviews the recent studies on the nanofiltration membranes comprising various nanomaterials, including the metal and metal oxide nanoparticles, carbon-based nanomaterials, metal-organic frameworks (MOFs), water channel proteins, and organic micro/nanoparticles. Finally, a perspective is given on the further exploitation of advanced nanomaterials and novel strategy for fabricating nano-based nanofiltration membranes. Moreover, the development of precision instruments and simulation techniques is necessary for the characterization of membrane microstructure and investigate the separation and antifouling mechanism of nanofiltration membranes prepared with nanomaterials.

**Key words:** nanofiltration; separation; membranes; nanocomposite; nanomaterials

## 1. Introduction

Water is an essential resource for our lives, however, 3.9 billion people would live in water-scarcity regions on the earth by 2030 (as estimated by World Water Council). In addition to

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