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Discussion on key issues regarding the promotion of large-scale utilization of seawater desalination in coastal cities of China

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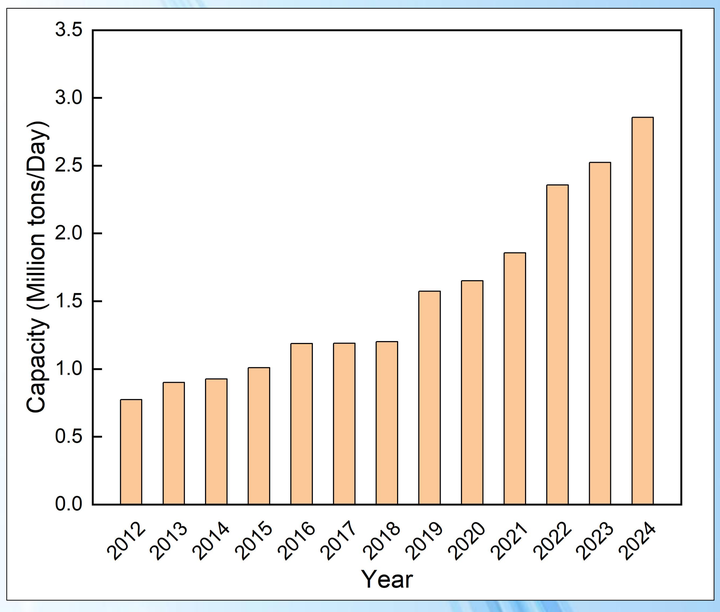
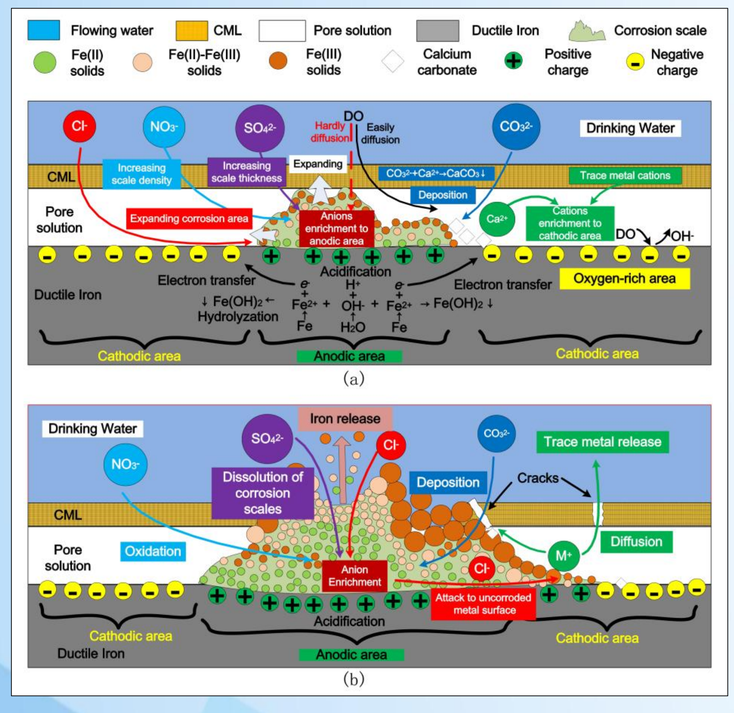
Background: Seawater desalination, a critical technology for coastal cities to address water scarcity, is increasingly attracting attention. By 2024, China's seawater desalination capacity had reached 2.8 million tons per day. Nevertheless, the actual utilization rate of desalinated water remains relatively low. For instance, in Tianjin, the capacity utilization rate stands at approximately 50%.The primary contributing factors encompass the limited public acceptance of desalinated water for direct consumption, coupled with the inadequate compatibility of existing water supply infrastructure and application scenarios, which consequently constrains alternative utilization.



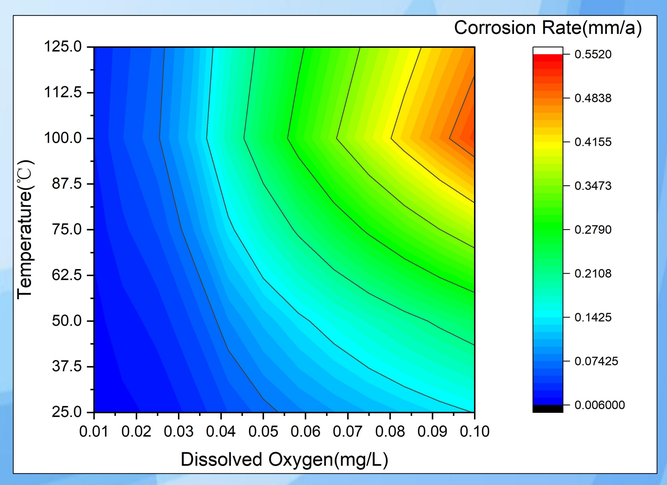
(1) Water quality safety when desalinated water enters municipal pipelines:



An in-situ in-situ scanning vibrating electrode technique (SVET) with micron-scale resolution, microscopic scale detection and water quality analysis was used to investigate the corrosion behavior and metal release from distribution pipes throughout the entire cement mortar lining (CML) failure process. Metal pollutants release occurred at three different stages of CML failure process, and there were potential risks of water quality deterioration exceeding the maximum allowable levels set by national standards in the partial failure stage and lining peeling stage. This study provides valuable information on the relationship between pipe corrosion and the release of pollutants, helping to mitigate corrosion induced water contamination and improve drinking water safety in drinking water distribution systems.

(2) Long-distance transportation of desalinated water for industrial direct supply:

Corrosion behavior of L290M steel under varying temperatures, chloride ion concentrations, and dissolved oxygen (DO) conditions were investigated. The results showed that corrosion significantly intensified under high-temperature, low-DO conditions, generating loose and easily detachable Fe_3O_4 corrosion products. A method combining dissolved oxygen control with water quality management was proposed to effectively meet the requirements of corrosion control and water quality maintenance.



Prospect: Developing suitable water supply models for municipal and industrial uses with different water quality requirements is essential for expanding the application scenarios of desalinated water and supporting China’s efforts to alleviate the water crisis and combat climate change.