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ע״ש וולפסון
The Wolfson Department of Chemical Engineering

Wolfson Department of Chemical Engineering Seminar

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Room 6

Nanofiltration in phosphoric acid industry: Purification and acid recovery

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MSc Seminar

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Phosphoric acid (H_3PO_4) is a key chemical in fertilizer, food, and battery industries, with growing demand for high-purity acid for lithium iron phosphate (LFP) cathode production. However, wet-process phosphoric acid (WPA), which dominates global production, contains high levels of impurities such as Fe^{3+}, Al^{3+}, Ca^{2+}, and F^-, restricting its use in high-value applications. Conventional purification methods like solvent extraction are costly and environmentally challenging. This study investigates nanofiltration (NF) as a sustainable and scalable alternative for phosphoric acid purification and recovery. Five commercial acid-resistant membranes were evaluated using a SEPA CF crossflow system with WPA and solvent-extracted acid feeds at varying P_2O_5 concentrations (20–40%) and pressures (30–60 bar). Performance was assessed in terms of flux, impurity rejection, and membrane stability under highly acidic conditions. Among the tested membranes, A-3014 showed the best balance between permeability and selectivity, achieving >96% rejection of Fe^{3+} and Al^{3+} with stable flux. Increasing acid concentration caused a sharp flux decline due to higher viscosity and osmotic pressure, while Ca^{2+} rejection remained lower because of its smaller hydrated radius and charge density. The results confirm that nanofiltration provides an efficient, modular, and environmentally friendly route for producing food- and battery-grade phosphoric acid, supporting future implementation of membrane-based or hybrid NF–SX systems in the phosphoric acid industry.