

Estimation of the gel layer concentration in ultrafiltration: Comparison of different methods

María-Cinta Vincent-Vela^{a*}, Silvia Álvarez-Blanco^a, Jaime Lora-García^a,
Enrique Bergantiños-Rodríguez^b

^aDepartment of Chemical and Nuclear Engineering, Polytechnic University of Valencia, C/Camino de Vera s/n 46022 Valencia, Spain
Tel. +34 96 387 7000 ext. 79387; Fax. +34 96 387 7639; email: mavintve@iqn.upv.es

^bDepartment of Chemical Engineering, Polytechnical Institute José A. Echeverría, Ave. 114, No. 11901, Havana, Cuba

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ABSTRACT

Fouling is one of the major limitations of membrane applications. Gel layer formation is a common fouling mechanism that increases the membrane fouling resistance. In this work the estimation of the gel layer concentration was performed from experimental values obtained in several ultrafiltration experiments using three methods: the gel-polarization model, the mechanistic model for gel layer formation proposed by Song and an expression of the concentration polarization modulus developed for tubular membranes and turbulent flow. The results were compared and analyzed. Two types of monotubular ceramic membranes with different MWCO (5 and 15 KDa) were used in the experiments. Polyethylene glycol (PEG) of 35,000 Da in distilled water was used as feed. The experiments were performed at different feed flow rates (1–3 m/s), transmembrane pressures (0.1–0.5 MPa), temperatures (15–40°C) and constant feed concentrations (5–15 g/L). Values of the gel layer concentration estimated with the gel-polarization model differed significantly from the ones estimated using the other two methods previously mentioned. Therefore, the gel-polarization model was less suitable for the gel layer concentration estimation than the others.

Keywords: Model; Ultrafiltration; Gel layer

* Corresponding author.