Minimum Membrane Area of a Pertration Process for Cr(VI) Removal and Recovery

Sergio M. Corvalán†, María F. San Román†, Inmaculada Ortiz‡ and Ana M. Eliceche†
† PLAPIQUI-CONICET, Chemical Engineering Department, Universidad Nacional del Sur, Camino La Carrindanga km 7, 8000 Bahía Blanca, Argentina
‡ Departamento de Ingeniería Química y Q.I., ETSIIyT, Universidad de Cantabria, Avenida de los Castros, 39005 Santander, Spain.

Abstract
A pertration membrane plant is designed for the treatment of wastewater containing hexavalent chromium and its recovery for industrial reuse. Pertration is a new technology that combines the efficiency of emulsion liquid membranes with the advantages of using hollow fibber membrane modules. It can selectively remove low concentrated metals from process streams and reach high concentrations of the recovered stream required for industrial reuse of pollutants. The total membrane area required is minimised, complying with effluent disposal regulations and concentrations levels required for reusing Cr(VI). The algebraic and differential equation system modelling the mass transfer along the membrane modules for the continuous plant operation are presented. The differential equations are discretised using orthogonal collocation on finite elements in order to generate a nonlinear programming problem. The estimation of the minimum membrane cost allows the evaluation of its industrial application.

Keywords: pertration, chromium recovery, wastewater, membranes.

* Author to whom correspondence should be addressed: scorvalan@plapiqui.edu.ar