Radioactive waste treatment using membrane separation processes

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The performance of a nanofiltration membrane for treatment of a low-level radioactive liquid waste was investigated through static and dynamic tests. The liquid waste ("carbonated water") was obtained during conversion of UF_6 to UO_2 [1]. This waste cannot be discarded without an adequate pre-treatment because it presents both chemical and radiological hazards [2,3]. For this reason, this work aimed at evaluating the performance of a NF membrane to treat a radioactive liquid waste [4-6]. In the static tests, membrane samples were immersed in the waste for 24, 48 or 72 h. The transport properties of the samples (hydraulic permeability, permeate flow, selectivity) were evaluated before and after the immersion in the waste. In the dynamic tests, the waste was permeated in a permeation flow front system under 0.5 MPa, to determine the selectivity of NF membranes to uranium. The surface layer of the membrane was characterized by zeta potential, field emission microscopy, atomic force microscopy and infrared spectroscopy [7]. The static test showed that the pore size distribution of the selective layer was altered, however the membrane surface charge was not significantly changed. 99% of uranium was rejected after the dynamic tests (Table 1).

Table 1. Uranium rejection and permeate fluxes of the NF membrane after static tests

Uranium rejection (%)	Time (h)	Permeate flux* ($L\ m^{-2}\ h^{-1}$)
99.0	24	1.4
99.0	48	1.3
99.0	72	1.2

* Initial permeate flux: 2,5 $L\ m^{-2}\ h^{-1}$ (after 3 h)

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