

AGEING OF REVERSE OSMOSIS MEMBRANES UNDER GAMMA IRRADIATION

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Reverse osmosis (RO) shows a real growth among the water and wastewater treatment processes available (evaporation, ions exchange, electrodialysis) since forty years. RO has become the most used processes for desalination of seawater or saline water.

Following Fukushima-Daiichi accident, RO has been chosen as the final treatment of the seawater used to cool the damaged nuclear reactors. Only very few studies and data has been published about RO applied to radioactive wastewater. Currently RO membranes are made of polymers that are sensitive to irradiation and could be strongly damaged due to these ionizing radiations. Data about the ageing of the membranes under these operating conditions are very difficult to obtain even if RO seems to be efficient in the process used in Fukushima.

The main aim of this work, supported by EDF and AREVA, is to better understand the degradation mechanisms and to quantify the effect of irradiation on the membrane during the filtration of radioactive wastewater. Some experimental parameters have been varied (contact with oxygen, with water, irradiation dose and dose rate) to quantify the impact on physico-chemical properties and separation performances of the membrane. Dose and dose rate as well as the γ irradiation source used have been chosen in link with realistic cases of pollution by nuclear elements. The results obtained show that the main degradations are appearing above a dose higher than 100kGy and have some consequences on the intrinsic properties of the polymers and on the separation performances of the RO membrane.