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Nanofiltration applied in gold mining effluent treatment: evaluation of chemical cleaning and membrane stability

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ABSTRACT

The objectives of this study were (1) to determine the best conditions of chemical cleaning of a nanofiltration (NF) membrane (NF90) employed in the treatment of gold mining effluent, and (2) to investigate the effects of continuous exposure to mining effluent and an acid cleaning agent on NF characteristics. NF fouling was mainly due to inorganic species, and calcium sulfate ($\text{CaSO}_4 \cdot 0.5\text{H}_2\text{O}$) was identified over membrane surface. Therefore, acid solutions were the most efficient in membrane cleaning, and among them hydrochloric acid (HCl) showed the best performance. Cleaning without recirculation (soak) was not effective and thus 90-minute recirculation was chosen as the best cleaning procedure. The NF membrane was exposed to the effluent and to the combined effluent and HCl solution for 285 days. Modifications in hydrophobicity, effective pore radius, fouling, and surface charge were observed. The retention of magnesium sulfate and glucose by the membrane exposed to the combined effluent and cleaning solution was statistically lower, what endorses the importance of cleaning conditions optimization. No indication of degradation of the polymeric material of the

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