

The feed solution was a bovine serum albumin (BSA, purity>98%, Sigma-Aldrich, Germany) solution with a concentration of 1% w/w.

The fouling tests were carried out at 25 °C and transmembrane pressure of 1 bar, while two different crossflow velocities were compared, 0.35 m/s and 2 m/s. After the fouling test, the cleaning procedure included a rinsing step performed with distilled water during 30 minutes, a chemical cleaning step and a final rinsing step until neutral pH was reached. The chemical cleaning step (with NaOH solution) was carried out at a fixed transmembrane pressure of 1 bar, while temperature and pH of the NaOH solution and crossflow velocity were varied according to an experimental design carried out with STATGRAPHICS.

Results

Figure 2 shows an example of the evolution of flux with time during BSA ultrafiltration for both crossflow velocities and both membranes. It can be observed that the membrane with larger pore size (M100) shows a higher flux than the membrane with smaller pore size (K131) for both cross flow velocities tested. In addition, as it was also expected, higher cross flow velocities offer higher fluxes also for both membranes.

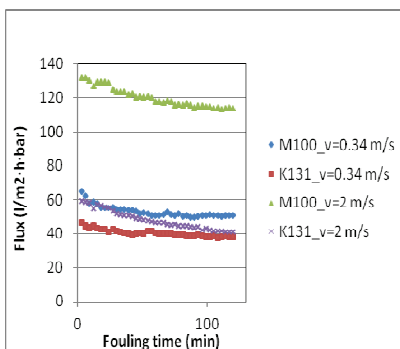


Table 1: Permeability recovery depending

Permeability (%) M100	Permeability (%) K131	Temperature (°C) and time (min)
93.35	78.03	45°C, 45 min
83.27	72.75	30°C, 45 min
97.61	87.47	45°C, 30 min
59.25	68.05	30°C, 30 min

Fig 2: Permeate flux during BSA

Table 1 shows the degree of recovery of the initial permeability for both membranes at two different temperatures of the NaOH solution and for two different durations of the cleaning step. For both membranes, the highest permeability recovery was obtained when the cleaning lasted 30 min and it was performed at 45°C. Regarding the duration of the process, there were no significant differences between the results obtained when the cleaning lasted 30 and 45 min. The lowest permeability recovery was obtained for the cleaning conditions less aggressive, 30°C and 30 minutes of the cleaning step.

Discussion

According to the results, the most important factor in the chemical cleaning step was the temperature of the NaOH solution; the higher the temperature, the greater the permeability recoveries were. The duration of the cleaning step was also studied. When the cleaning was performed at 45°C and lasted 30 min a high permeability recovery was observed. However, a further increase in the cleaning time was observed to slightly reduce the cleaning efficiency, thus indicating the interest in selecting the optimum cleaning conditions.

Acknowledgements

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References

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