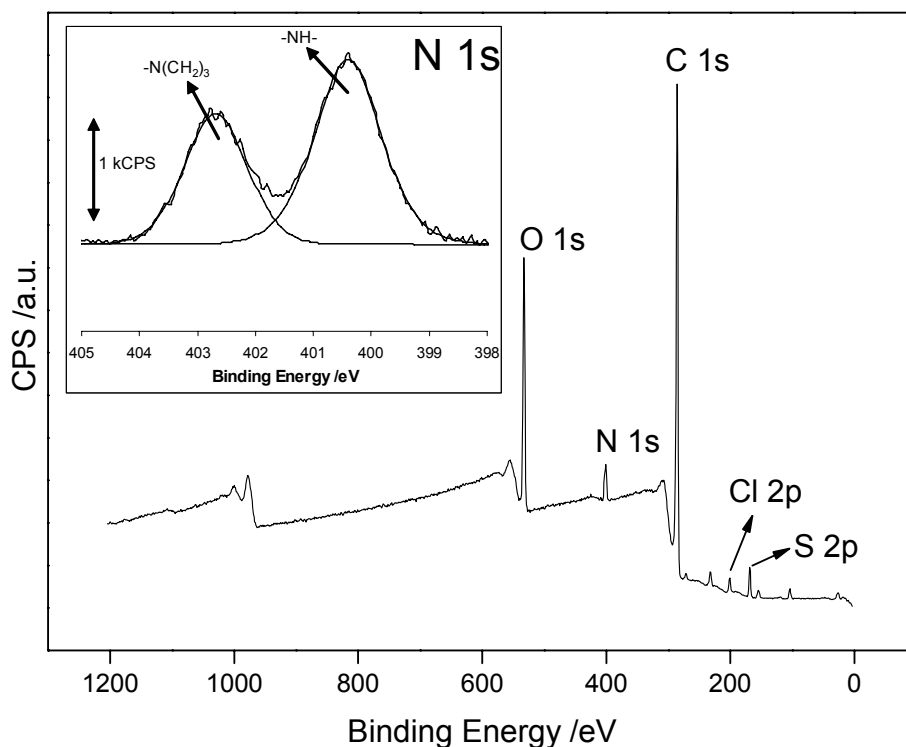


## Supporting information



XPS survey spectrum and decomposed N 1s core level spectrum (inset) of the CMS commercial cation exchange membrane.

Table 1. Properties of the CMS commercial cation exchange membrane.

Name	Neosepta CMS
Manufacturer	Tokuyama Corp.
Type	Cation
Thickness (mm)	0.145-0.150
Water content (%)	22-30
Exchange capacity (m equiv./g)	2.20 ± 0.05
Structure property	PS/DVB
Transport number of H <sup>+</sup>	1.00
Charged group	Sulfonate
Backbone	PVC
Density of dry membrane $\rho_d$ (g/cm <sup>3</sup> )	1.16 ± 0.10
Density of wet membrane $\rho_m$ (g/cm <sup>3</sup> )	1.20 ± 0.10