

Supporting Information

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Normalisation of the ATR-FTIR spectra

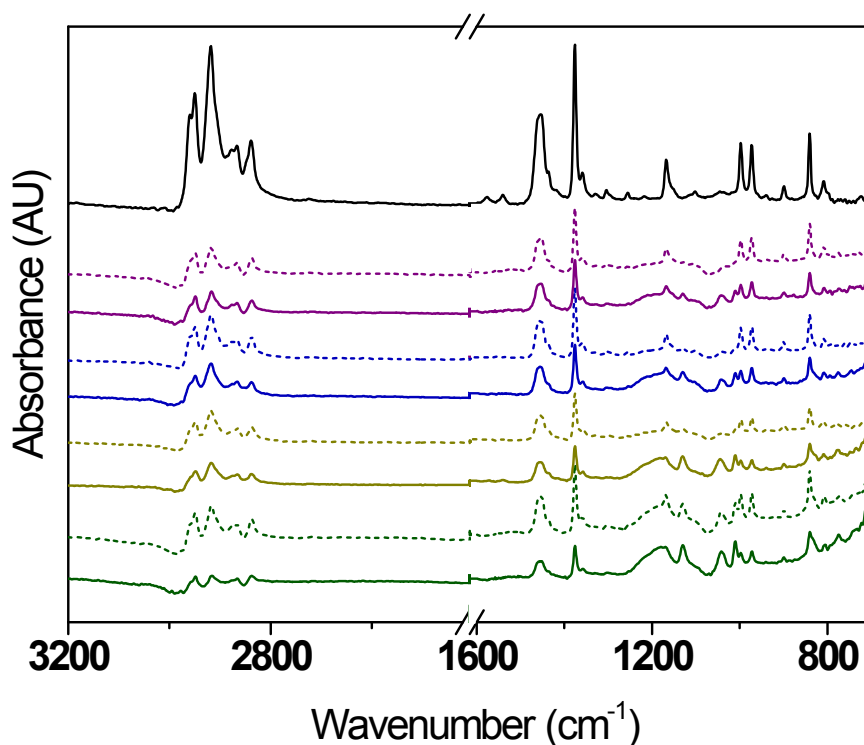


Fig. S1 ATR-FTIR spectra of pristine PP polymer (–) and multi-solvent-exchanged PP-*g*-PLiSS membranes with 3% (–, –), 6% (–, –), 29% (–, –) and 42% graft level (–, –). Dashed and solid lines refer to spectra obtained from unmodified and grafted membrane sides, respectively.

ATR-FTIR spectroscopy was used to confirm the grafting of styrene sulfonate (SS) at and near the surface of the PP films as well as the asymmetry of the PP-*g*-PLiSS membranes. The non-normalised spectra of both sides of the different membranes are shown in Fig. S1. Polypropylene has strong bands near 2950, 2800 cm^{-1} , 1460 cm^{-1} , and 1376 cm^{-1} corresponding to various aliphatic C-H stretching and bending modes.¹ Additionally, bands of medium intensity are observed near 1155 and 970 cm^{-1} . These signals can be assigned to $-\text{CH}_3$ and $-\text{CH}_2$ rocking and $\text{CH}-\text{CH}_2$ and $\text{CH}-\text{CH}_3$ stretching vibrations.² Comparing the pristine PP film with the grafted membranes, four new absorption peaks are observed between 1200 and 1000 cm^{-1} . The signals at 1182 and 1044 cm^{-1} are due to antisymmetric and symmetric vibrations of the SS groups whereas the signals observed at 1130 and 1011 cm^{-1} originate from in-plane vibrations of the benzene ring.³

In order to follow the temporal development of the SS layer at and near the surface of PP as a function of the graft level, all spectra were shifted by their offset at 2500 cm^{-1} and then normalised with respect to the height of the PP peak at 1376 cm^{-1} to obtain the spectra in Fig. 4.

Galvanostatic curves

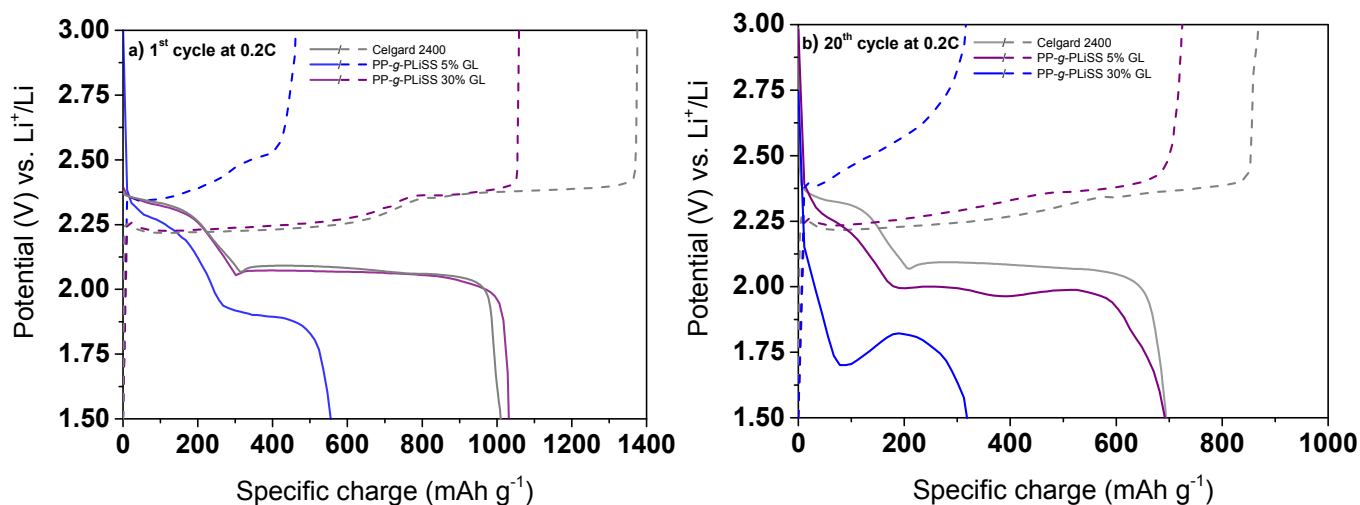


Fig. S2. Galvanostatic curves of the (a) first and (b) twentieth lithiation and delithiation for Li-S cells assembled with Celgard 2400 and 5 and 30% grafted PP-*g*-PLISS.

References

1. L. Cernakova, D. Kovacik, A. Zahoranova, M. Cernak and M. Mazur, *Plasma Chemistry and Plasma Processing*, 2005, **25**, 427-437.
2. N. Othman, H. Ismail and M. Mariatti, *Polymer Degradation and Stability*, 2006, **91**, 1761-1774.
3. G. Zundel, *Hydration and Intermolecular Interaction: Infrared Investigations with Polyelectrolyte Membranes*, Elsevier Science, 2012.