

## Oxygen Redox Reaction in lithium-based electrolytes from salt-in-solvent to solvent-in-salt

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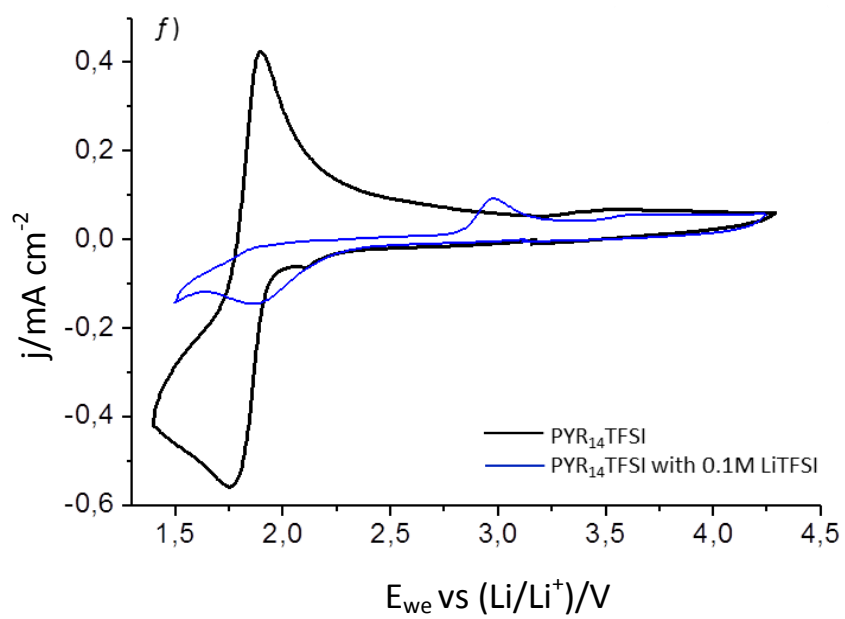
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**Table 1S.** Properties of tetraethylene glycol dimethyl ether (TEGDME) compared to other solvents.

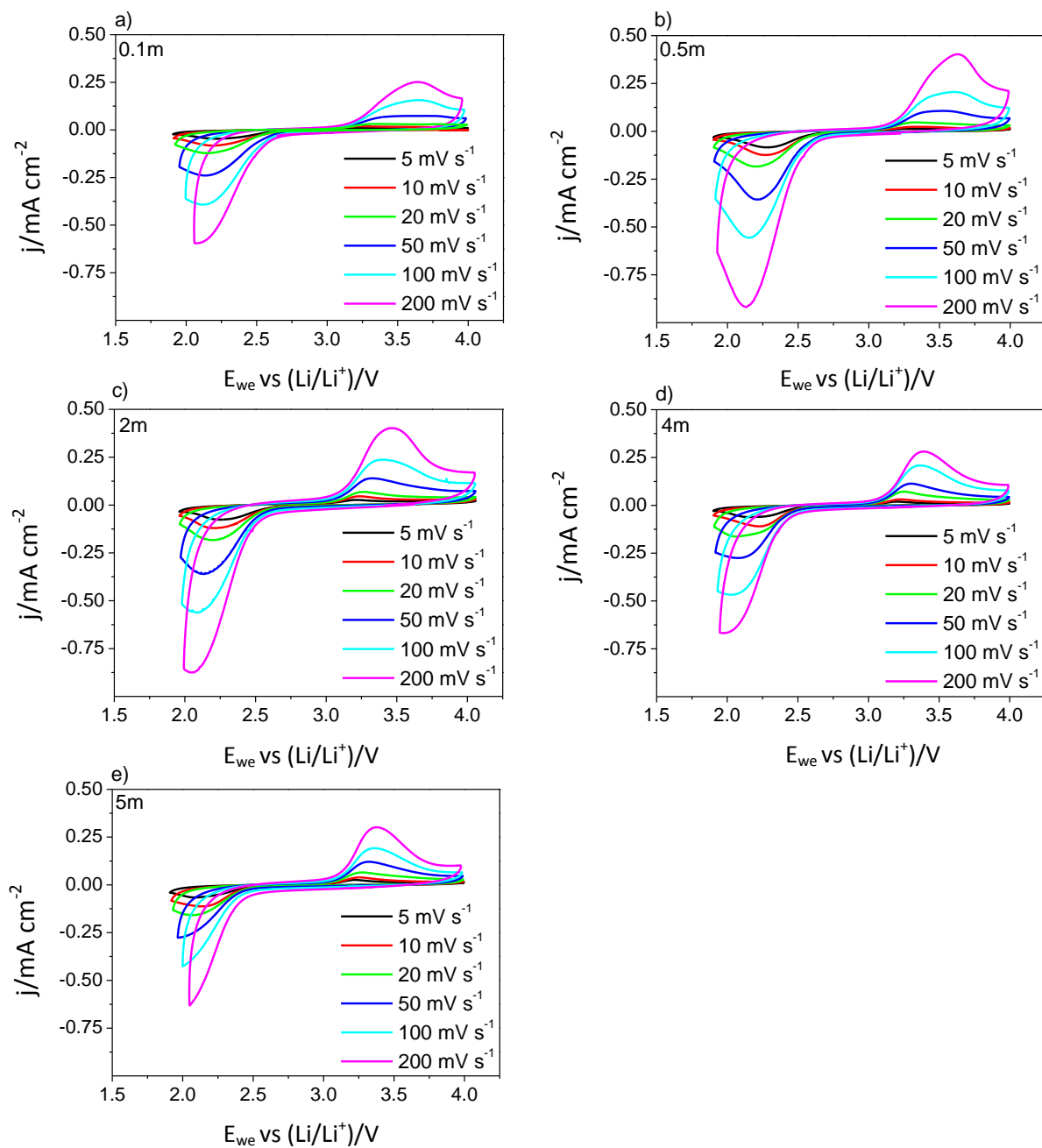
Solvent	Dielectric constant $\epsilon$	Viscosity $\eta$ (cP)	Oxygen solubility Bunsen coef.	Donor Number DN (kcal/mol)
TEGDME <sup>1,2</sup>	7.79	3.6	0.0993	16.6
Ethylene carbonate (EC) <sup>1,3,4</sup>	89.60	1.85*	0.0382**	16.4
Dimethyl sulfoxide (DMSO) <sup>1,3,5</sup>	46.45	1.99	0.0416	29.8
1,2-Dimethoxyethane (DME) <sup>1,5</sup>	7.2	0.46	0.2143	20.0
Ionic liquids (ILs) <sup>8</sup>	10-15	40-800	--	--

\* Viscosity at 40°C

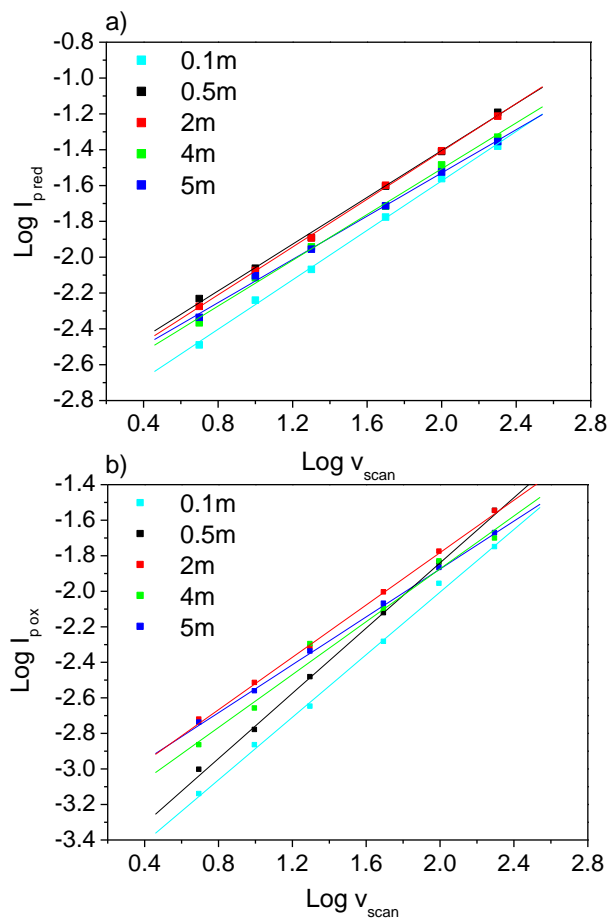
\*\* Calculated from mixtures with PC



**Figure 1S.** CVs at  $20 \text{ mV s}^{-1}$  of a glassy carbon electrode (GCE) in  $\text{O}_2$ -saturated PYR<sub>14</sub>TFSI with and without LiTFSI at  $20 \text{ mV s}^{-1}$ .



**Figure 2S.** CVs at different scan rates of a glassy carbon electrode (GCE) in  $O_2$ -saturated TEGDME-LiTFSI (a) 0.1m, (b) 0.5m, (c) 2m, (d) 4m, (e) 5m solutions.



**Figure 3S.** Logarithm plots of the reduction (a) and oxidation (b) peak currents with the scan rate ( $v_{\text{scan}}$ ) of a GCE in oxygen saturated LiTFSI-TEGDME solutions. The currents are given in mA and the scan rate in  $\text{mV s}^{-1}$ .

## References

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