Supporting Information

Two for One: Propylene Carbonate Co-solvent for High Performance Aqueous Zinc-ion Batteries Remedies Persistent Issues at Both Electrodes

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COMPUTATIONAL METHODS

Quantum chemical DFT calculations

1. Binding energy calculations in implicit solvent model

All quantum calculations were performed using the Gaussian 16 package\(^1\) and all visualizations for these calculations were carried out in GaussView (version 5.0.9).\(^2\)

To obtain an estimate of the strength of interaction between zinc ion and other components of the electrolyte, we calculate the binding energy of various species with the zinc ion in the implicit solvent model (SMD)\(^3\) using water solvent. Like Dong et al.,\(^4\) the systems were geometry optimized at the B3LYP level of theory and using the 6-311G(d) basis set for all atoms barring zinc. For zinc, a B3LYP level of theory and the SDD basis set was employed. D3 version of Grimme’s dispersion corrections were employed for these calculations.\(^5\)

Frequency calculations confirmed the absence of any imaginary frequency. The binding energy \(E_b\) of complex containing components 1 and 2 was calculated as:

\[
E_b = E_{1,2} - E_1 - E_2.
\]

Where \(E\) is the energy of the optimized structure.

The values for binding energies are provided in the results section.

2. Reduction Potentials

The free energy of formation \([\Delta G_{S,298} = G_{S,298}(X^-) - G_{S,298}(X)]\) of \(X^-\) from \(X\) for four complexes in implicit solvent phase (water) was calculated using the SMD.\(^3\) \(X\) represents a molecule, ion or a zinc complex that can undergo reduction. Both \(X\) and \(X^-\) were optimized in the same way as was done for binding energy calculations. The optimized structure of \(X\) was used as the starting configuration for the optimization of \(X^-\). D3 version of Grimme’s dispersion corrections were employed for these calculations.\(^5\) The reduction potentials of the complexes were obtained therefrom using the following expression.\(^4\)

\[
E_{\text{red}} = -(\Delta G/F) - 3.656 \text{ V}
\]

Where \(F\) is the Faraday constant.
The values for reduction potentials are provided in the results section.

**Molecular dynamics (MD) simulations**

1. **Force field**

The following were simulated using MD simulations, viz.,

1. TW: 1 M Zn(OTf)$_2$ in water,
2. PC10 TW: 1 M Zn(OTf)$_2$ in water (90% by weight) and Propylene Carbonate (PC) (10% by weight)
3. PC20 TW: 1 M Zn(OTf)$_2$ in water (80% by weight) and PC (20% by weight).
4. To understand the effectiveness of PC as an additive a DMC based system was also simulated.
   
   DMC-TW: 1 M Zn(OTf)$_2$ in water with the same number of molecules of each type as PC20 TW. However, using DMC in the place of PC.

The bonded and non-bonded force field parameters used for triflate anion, PC, and DMC were the General Amber force-field parameters (GAFF), generated by Antechamber. Restrained Electrostatic Potential (RESP) charges were adopted for the different atom types of these molecules. Water was modeled using TIP-3P.

The Lennard-Jones parameters and charge used for zinc ion are of Amber99sb-ildn and are provided in Table S1. Charge on zinc ion was taken to be +2. All tables are provided at the end.

2. **Method**

PACKMOL software (Version 18.002) was used to generate random initial configurations for all systems. System details are as in Table S2. GROMACS-2018.3 package was used to evolve particle trajectories in time. A timestep of 1 fs and the leap-frog algorithm were used to integrate the equations of motion. The Coulomb and Lennard-Jones (LJ) cut-off distances were chosen according to the GAFF to be 10 Å. 1-2 and 1-3 non-bonded interactions are absent. Non-
bonded interactions between 1-4 atom pairs were scaled by 0.5 for Lennard-Jones interactions and by 0.8333 for Coulomb interactions. For all other atom pairs, a scale factor of 1.0 was used for both kinds of non-bonded interactions. Long range interactions were included using the particle-particle mesh Ewald method.\textsuperscript{11} LINCS constraints were used for all intramolecular bonds involving hydrogens.\textsuperscript{12} Periodic boundary conditions were applied. Arithmetic mean and geometric mean were used as combination rules for sigma and epsilon, respectively. \textit{v}-rescale thermostat\textsuperscript{13} was employed for all simulations with a coupling time-constant of 0.5 ps. The thermostat was coupled to the system once every 10 MD steps. Long range temperature and pressure corrections were employed.

Three independent configurations for each system were packed, energy minimized, and evolved in time. \textbf{All analyses are averaged over the results of three independent runs.} The random configurations were first energy minimized in the force field. Thereafter, the temperatures of the all the systems were ramped from 0 K to 298 K under constant volume conditions at the rate of 0.1 K/ps, and then equilibrated at 298 K for 2 ns. Following this, NPT equilibration runs at 1 bar pressure for a duration of 5 ns were performed for each system using Berendsen barostat\textsuperscript{14} with a coupling time-constant of 2.0 ps. The barostat was coupled to these systems once every ten steps. Subsequently, NPT production runs of duration 10 ns were run using Parrinello-Rahman barostat.\textsuperscript{15,16} The time-constant for pressure coupling was 2.0 ps. The Parrinello-Rahman barostat was coupled to the system at every step. Finally, the average density obtained during NPT production was used as initial configurations for NVT runs generated for 50 ns. GROMACS-2018.3\textsuperscript{10} modules and FORTRAN codes developed in-house were used to analyze NVT particle trajectories.

\section*{3. Agreement level of force field used with experiments}

The validity of the force field used was checked by comparing simulation densities against the densities obtained from experiments (Table S3).
4. Calculation of population of different zinc solvation shell types

The zinc solvation shell of all zinc ions over the last 45 ns of NVT trajectories were determined to arrive at the population of various zinc solvation shell types. The populations were averaged over three independent runs. In order for a water molecule or a PC molecule or a triflate anion to be a part of a zinc ion’s solvation shell, the distance between OW of water and Zn, or OC of PC and Zn, or any OTf of triflate anion and Zn, was required to be less than or equal to 2.5 Å.

Figure S1. Digital picture demonstrating the complete miscibility of the electrolyte constituents.
Figure S2. Ignition test of PC20 TW electrolyte.

Figure S3. Radial distribution functions (RDF) (left axis) and running coordination numbers (CN) (right axis) for a) OC – HW (hydrogens of water), b) OC – OW and, c) the center of mass (COM) of PC – COM of H$_2$O.

Organization of water around PC: RDF and CNs between different atom pairs or center of masses showing that PC grabs water and significantly interacts with it through hydrogen bonding (Figure S2a). Hydrogens of water (HW) are closest to OC of PC. (Also see results on hydrogen bonding). PC retains 2.6 water molecules around its OC atom at a distance of 3.5 Å (donor O – acceptor O distance in hydrogen bonds; figure S2b) in PC20 TW. As one might expect, there are 12 water molecules around the PC COM (Figure S2c). At 20 wt.% PC, the significant PC-water interaction starves zinc of roughly 0.3 water molecules relative to TW, which allows for both PC and additional triflate anions to enter zinc’s primary solvation shell.
**Percentage of free water molecules**

A free water molecule is defined as a water molecule which has other water molecules alone as its nearest neighbors, i.e., a water molecule not coordinating or interacting with zinc ions, PC molecules, or triflate anions, in this case. The cutoff interaction distance between OW and Zn was taken to be 2.5 Å. Water and PC were considered to interact through hydrogen bonds. The carbonyl oxygen atoms (OC) were considered to be the hydrogen bond acceptors. The cutoff distance for OW and OC interaction was therefore taken to be 3.5 Å. The oxygens of the triflate anions interact with the hydrogens of water molecules. This again made the cutoff choice of 3.5 Å for OW to OTf distance, a suitable choice. We find that the percentage of free water decreases from ~68% in TW, to ~64% in PC10 TW, to ~58% in PC20 TW. This reduction is due to water molecules getting increasingly coordinated to PC with increase in the latter’s proportion in the electrolyte.

**Hydrogen bonds formed between water molecules:**

In MD trajectories, setting the hydrogen bond distance (donor oxygen to acceptor oxygen) criterion to be 3.5 Å, and the hydrogen bond angle (O-H--O) criterion to be between 130° to 180°, we find the following:

1. In the TW system, on an average, each water molecule forms 1.96 water-water hydrogen bonds.

2. In the PC10 TW system, on an average, each water molecule forms 1.90 water-water hydrogen bonds.

3. In the PC20 TW system, on an average, each water molecule forms 1.83 water-water hydrogen bonds.

The hydrogen bonds formed between PC and water comes at the cost of partially breaking the water-water hydrogen bond network, consistent with the reduction in the percentage of ‘free
water’ in the solution. A higher weight percent of PC in the solution results in a larger disruption of the water-water hydrogen bonding network.

Figure S4. Binding energy in SMD$^3$ water implicit solvent of a) Zn$^{2+}$H$_2$O, b) Zn$^{2+}$PC, and c) Zn$^{2+}$OTf$^-$ . Distances are in units of Angstrom. Atom colors: Oxygen – red, hydrogen – white, carbon – cyan, zinc – gray, sulphur – yellow, fluorine – pink.

The binding energy of Zn$^{2+}$-H$_2$O (-22.87 kcal mol$^{-1}$) is larger than that of Zn$^{2+}$-PC (-18.14 kcal mol$^{-1}$), and Zn$^{2+}$-OTf (-18.78 kcal mol$^{-1}$). This fact, coupled with the fact that the proportion of water in the electrolyte is largest, is reflected in n$_{OW}$:n$_{OC}$:n$_{OTf}$ = 6:0:0 being the most probable zinc solvation shell type, and water being the predominant participant in interactions with zinc, even in non-hexa-aquo complexes. The values of the binding energies are comparable, thereby not precluding the formation of zinc complexes containing PC and OTf$^-$, rather the comparability of the energies make complexes such as n$_{OW}$:n$_{OC}$:n$_{OTf}$ = 5:1:0, 5:0:1, second and third most probable according to our MD simulations. Quantum chemical calculations of the free-energy of formation ($\Delta_f G$) of n$_{OW}$:n$_{OC}$:n$_{OTf}$ = 6:0:0, 5:1:0, 5:0:1 complexes in gas phase (below) have also been calculated. These reveal that the formation of PC and OTf$^-$ containing complexes are possible and support our MD results. PC and OTf$^-$ entering the zinc solvation
shell is a function of the amount of PC in the electrolyte, binding and free energies, and temperature. Both these quantum chemical calculations (gas and SMD phases) have their own limitations as does the force field used for MD simulations. However, the presence of PC and OTf⁻ in the zinc solvation shell (in as small quantities as ~17% (1/6th) in the most probable zinc solvation shells (barring 6:0:0)) is either shown or strongly considered plausible by all of them.

\[
\Delta_f G_{6:0:0} = -318.44 \text{ kcal mol}^{-1} \\
\Delta_f G_{5:1:0} = -325.65 \text{ kcal mol}^{-1} \\
\Delta_f G_{5:0:1} = -483.47 \text{ kcal mol}^{-1}
\]
Figure S5. Populations of all zinc primary solvation shell compositions in TW, PC10 TW, and PC20 TW electrolytes. A zoomed-in version of the same is presented in Figure 2e of the main manuscript. Refer Table S4 for numerical values.
Figure S6. The calculated reduction potentials of free OTf\(^{-}\), free PC, Zn\(^{2+}\)-OTf\(^{-}\) and Zn\(^{2+}\)-PC species.

Having looked at populations of various solvation shell types for zinc ions, it is useful to look at how the reduction potentials of the fundamental units of some of these zinc complexes compare to that of Zn\(^{2+}\). Bare triflate anion and PC molecule have a much lower reduction potential (-2.79 V and -2.34 V, respectively) compared to the Zn\(^{2+}\)/Zn redox couple. Therefore Zn\(^{2+}\) ions will preferentially undergo reduction before triflate anion and PC. Interestingly however, Zn\(^{2+}\)OTf (0.13 V), and Zn\(^{2+}\)PC (0.23 V) have a higher reduction potential compared to Zn\(^{2+}\)/Zn redox couple, and therefore preferentially undergo reduction in comparison to zinc. This can potentially allow for the preferential formation and deposition of fluoride and carbonate derivatives of zinc as SEI instead of hydroxide derivatives of zinc predominantly formed in the absence of PC.
Figure S7. a,e) Digital photographs, b,c,f,g) SEM images and d,h) XRD patterns of Zn anode soaked in TW and PC20 TW electrolytes for over 3 weeks.
Figure S8. Impedance spectra of Zn|Zn symmetric cells collected in (a) TW and (b) PC20 TW electrolyte at various temperatures (inset shows the equivalent circuits which are used for fitting the spectra). (c) Arrhenius plots of TW and PC20 TW electrolytes (inset shows Arrhenius equation).
Figure S9. Cyclic voltammograms of Zn|Ti cells using a) TW and b) PC20 TW electrolytes at 1 mV s$^{-1}$. 

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**Figures S9.** Cyclic voltammograms of Zn|Ti cells using a) TW and b) PC20 TW electrolytes at 1 mV s$^{-1}$. 

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**Figure S10.** Voltage-capacity profiles of Zn|Cu cells cycled in PC10 TW electrolyte at a current density and an areal capacity of 1 mA cm\(^{-2}\) and 1 mAh cm\(^{-2}\), respectively.
Figure S11. Voltage-capacity profiles of Zn|Cu cells cycled at a current density and an areal capacity of 5 mA cm$^{-2}$ and 1 mAh cm$^{-2}$, respectively.
Figure S12. Voltage profiles of Zn|Cu cells in a) TW and b) PC20 TW electrolytes tested under ‘reservoir half-cell’ method.
**Figure S13.** Electrochemical impedance spectra along with its corresponding equivalent circuit of Zn|Zn cells cycled in a) TW and b) PC20 TW electrolytes.
Figure S14. XPS of Zn anode cycled in TW electrolyte.
**Figure S15.** Contact angle measurements on Zn anodes a,b) pristine and c,d) collected after 50 cycles.
Figure S16. XRD patterns of $V_2O_5$ cycled in TW and PC20 TW electrolytes collected after 100 cycles.
Figure S17. SEM images of V$_2$O$_5$ cathode collected after 100 cycles.
Figure S18. EDS mapping of Zn anode in Zn|V$_2$O$_5$ cells collected after 100 cycles
Comparison of Propylene carbonate (PC) with Dimethyl carbonate (DMC)

**Figure S19.** Comparison of results of MD simulations on DMC based and PC based zinc-water-triflate electrolyte solutions, at the same molecular ratios of Zn(OTf)$_2$:carbonate solvent: H$_2$O. PC-based electrolyte used for comparison is PC20 TW.

In order to know if the improved electrochemical performance of PC over DMC is at least in part due to the difference in the solvation shell composition of zinc ions in the two electrolytes, we simulated a Zn(OTf)$_2$-DMC-H$_2$O in the same molecular ratio as the PC20 TW system.

From figure S16a, we find that approximately 0.16 additional water molecules are expelled from the zinc ion solvation shell by PC in lieu of DMC. This favorable result possibly finds its roots in the fact that liquid PC has a higher static dielectric constant and molecular dipole moment (64.9, 4.94 D)$^{17}$ in comparison to DMC (3.087, 0.91 D),$^{18}$ i.e., PC is more polar than DMC. Although the extent of the carbonate entering the zinc solvation shell is small at low carbonate concentrations, from figure S16b, we find that at the same molecular ratio of PC and DMC in their respective electrolytes, approximately 2.4 times more PC is able to enter the zinc solvation shell than DMC. The above observations can be summarized using the average solvation shell composition formulae for the DMC-TW and PC20 TW electrolytes, which are Zn$^{2+}$[(H$_2$O)$_{5.41}$(DMC)$_{0.1}$(OTf)$_{0.49}$] and Zn$^{2+}$[(H$_2$O)$_{5.25}$(PC)$_{0.24}$(OTf)$_{0.51}$], respectively. Unlike PC20 TW wherein PC’s OC coordinates to 2.6 water molecules, DMC’s OC coordinates to only 2.15 water molecules. This difference can be clearly attributed to the lower dipole moment of DMC in comparison to that of PC.
Figure S20. Comparison of the cycling performances of Zn|V$_2$O$_5$ cells cycled in PC20 TW and DMC20 TW at current density 1 A g$^{-1}$. 
**Table S1:** Force field parameters for Zinc used in MD simulations

<table>
<thead>
<tr>
<th>Atom type</th>
<th>Sigma (Å)</th>
<th>Epsilon (kcal/mol)</th>
<th>Charge (e-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zn</td>
<td>1.95998</td>
<td>0.0125</td>
<td>2.0</td>
</tr>
</tbody>
</table>

**Table S2:** Summary of MD simulations

<table>
<thead>
<tr>
<th>System</th>
<th>$n_{\text{Zn(OTf)2}}$: $n_{\text{carbonate}}$: $n_{\text{H2O}}$</th>
<th>No. of $\text{Zn(OTf)2}$ formula units</th>
<th>No. of $\text{Zn}^{2+}$ ions</th>
<th>No. of triflate ions</th>
<th>No. of carbonate molecules</th>
<th>No. of water molecules</th>
<th>Equilibrated box length (Å)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TW</td>
<td>1:0:56</td>
<td>160</td>
<td>160</td>
<td>320</td>
<td>0</td>
<td>8960</td>
<td>67.14</td>
</tr>
<tr>
<td>PC10 TW</td>
<td>1:1:51</td>
<td>160</td>
<td>160</td>
<td>320</td>
<td>160</td>
<td>8160</td>
<td>67.02</td>
</tr>
<tr>
<td>PC20 TW</td>
<td>1:2:45</td>
<td>160</td>
<td>160</td>
<td>320</td>
<td>320</td>
<td>7200</td>
<td>66.50</td>
</tr>
<tr>
<td>DMC-TW</td>
<td>1:2:45</td>
<td>160</td>
<td>160</td>
<td>320</td>
<td>320</td>
<td>7200</td>
<td>66.34</td>
</tr>
</tbody>
</table>

**Table S3:** Density

<table>
<thead>
<tr>
<th>System</th>
<th>$\rho_{\text{simulation}}$ (g/cc)</th>
<th>$\rho_{\text{experiment}}$ (g/cc)</th>
<th>Percentage deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TW</td>
<td>1.204</td>
<td>1.208</td>
<td>-0.33</td>
</tr>
<tr>
<td>PC10 TW</td>
<td>1.222</td>
<td>1.225</td>
<td>-0.24</td>
</tr>
<tr>
<td>PC20 TW</td>
<td>1.245</td>
<td>1.235</td>
<td>0.81</td>
</tr>
<tr>
<td>DMC-TW</td>
<td>1.232</td>
<td>-</td>
<td>-</td>
</tr>
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</table>
Table S4: Solvation shell composition distribution of zinc across three electrolytes, obtained from MD simulations

<table>
<thead>
<tr>
<th>TW ( n_{wa}:n_{wc}:n_{in} )</th>
<th>PC10 TW ( n_{wa}:n_{wc}:n_{in} )</th>
<th>PC20 TW ( n_{wa}:n_{wc}:n_{in} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:0:0 - 60 %</td>
<td>6:0:0 - 43.12 %</td>
<td>6:0:0 – 43.75 %</td>
</tr>
<tr>
<td>5:0:1 - 33.54 %</td>
<td>5:0:1 – 35.62 %</td>
<td>5:0:1 – 24.79 %</td>
</tr>
<tr>
<td>4:0:2 – 5.62%</td>
<td>5:1:0 – 7.29 %</td>
<td>5:1:0 – 14.79 %</td>
</tr>
<tr>
<td>3:0:3 - 0.83 %</td>
<td>4:0:2 – 6.67 %</td>
<td>4:0:2 – 8.12 %</td>
</tr>
<tr>
<td>5:0:0 – 1.29E-03 %</td>
<td>4:1:1 – 5.42 %</td>
<td>4:1:1 – 5.42 %</td>
</tr>
<tr>
<td>4:0:1 – 3.89E-04 %</td>
<td>3:0:3 - 1.25 %</td>
<td>4:2:0 – 1.25 %</td>
</tr>
<tr>
<td>3:0:2 – 2.78E-05 %</td>
<td></td>
<td>3:1:2 – 1.25 %</td>
</tr>
</tbody>
</table>

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Table S5. Comparison of full cell performance reported on various cathode material in different aqueous and nonaqueous electrolyte.

<table>
<thead>
<tr>
<th>Additive</th>
<th>Electrolyte</th>
<th>Approx. Wt % of additive</th>
<th>Zn plating</th>
<th>Full cell performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Zn</td>
<td>Cu</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Current density (mA cm⁻²) and areal capacity (mAh cm⁻²)</td>
<td>Coulombic efficiency</td>
</tr>
<tr>
<td>DMC⁴</td>
<td>2m Zn(OTf)₂</td>
<td>55% DMC</td>
<td>5 and 2.5</td>
<td>99.8</td>
</tr>
<tr>
<td>Methanol¹⁹</td>
<td>2 M ZnSO₄/Water : Methanol (1:1) (vol ratio)</td>
<td>44.1% Methanol</td>
<td>1 and 0.5</td>
<td>99.7</td>
</tr>
<tr>
<td>Acetonitrile¹⁰</td>
<td>15 m Zn(OTf)₂/Water : acetonitrile (1:1) (vol ratio)</td>
<td>44.0% Acetonitrile</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>DMSO²¹</td>
<td>1.6 m ZnCl₂/Water : DMSO (4.3:1) (vol ratio)</td>
<td>20.3% DMSO</td>
<td>1 and 0.5</td>
<td>99.5%</td>
</tr>
<tr>
<td>Dioxane²²</td>
<td>1 M ZnSO₄/0.2 M MnSO₄/5% Dioxane</td>
<td>*4 and 2.5</td>
<td>99.8</td>
<td>~200</td>
</tr>
<tr>
<td>Glucose²³</td>
<td>1 M ZnSO₄/10 mM glucose in water</td>
<td>1.8 % Glucose</td>
<td>1 and 0.5</td>
<td>97.2</td>
</tr>
<tr>
<td>TEP²⁴</td>
<td>0.5 M Zn(OTf)₂/TEP : Water (1:1)(vol ratio)</td>
<td>51.6% TEP</td>
<td>*0.1 and 0.2</td>
<td>99.5</td>
</tr>
<tr>
<td>Ethylene glycol²⁵</td>
<td>2 M ZnSO₄/EG : Water (40:60) (vol %)</td>
<td>42.5% EG</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Urea²⁶</td>
<td>LiTFSI : Zn(TFSI)₂ : urea (1 : 0.05 : 3.8 : 2.0) (Molar ratio)</td>
<td>14.2% urea</td>
<td>*0.5 and 0.5</td>
<td>96.2%</td>
</tr>
<tr>
<td>System</td>
<td>Concentration</td>
<td>Dimmers</td>
<td>Electrode Material</td>
<td>Capacity (mAh g⁻¹)</td>
</tr>
<tr>
<td>--------</td>
<td>---------------</td>
<td>---------</td>
<td>--------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>TEP²⁷</td>
<td>0.5 M Zn(OTf)₂</td>
<td>TEP : H₂O (7:3) (vol ratio)</td>
<td>71.4% TEP</td>
<td>90.5</td>
</tr>
<tr>
<td>PC²⁸</td>
<td>2 M Zn(OTf)₂·2H₂O-PC</td>
<td>- - - - - -</td>
<td>- -</td>
<td>- -</td>
</tr>
<tr>
<td>PC/TEP²⁹</td>
<td>0.5 M Zn (CF₃SO₃)₂ TEP:PC(1:2)</td>
<td>- - - - - -</td>
<td>71.4%</td>
<td>TEP</td>
</tr>
<tr>
<td>Diethyl ether³⁰</td>
<td>3 M Zn(OTf)₂</td>
<td>0.1 M Mn(OTf)₂</td>
<td>1.49% Et₂O</td>
<td>- - - - -</td>
</tr>
<tr>
<td>Ethylene glycol³¹</td>
<td>Zn(OTf)₂·EG (1:5)</td>
<td>- - - - -</td>
<td>- -</td>
<td>-</td>
</tr>
<tr>
<td>Polyacrylamide³²</td>
<td>1 M ZnSO₄</td>
<td>0.5 M Na₂SO₄·H₂O, 0.1 M MnSO₄, and 1 g L⁻¹ polyacrylamide</td>
<td>- - - - -</td>
<td>20 and 1</td>
</tr>
<tr>
<td>1 M ZnSO₄³³</td>
<td>0.5 wt% PEO, 0.5 M Li₂SO₄, 1 M ZnSO₄</td>
<td>0.5% PEO</td>
<td>99.5%</td>
<td>1500</td>
</tr>
<tr>
<td>This work</td>
<td>1 M Zn(OTf)₂</td>
<td>PC·H₂O (20:80) (wt %)</td>
<td>20% PC</td>
<td>99.3%</td>
</tr>
</tbody>
</table>
References:


