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Evaluation of deep eutectic solvents as electrolytes for a non-aqueous vanadium redox battery

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Six different deep eutectic solvents (DESs) synthesized from either ammonium or phosphonium salts are employed as electrolytes for an H-type redox battery using vanadium acetylacetonate [$V(acac)_3$] as the electro-active species. Preliminary investigation show that the highest solubility of [$V(acac)_3$] is in a DES made from choline chloride and ethylene glycol (ethaline). Cyclic voltammetry indicate that ethaline is stable in an operating potential range of −1.8 to +1 V. The diffusion coefficients of $V(acac)_3$ in the electrolyte has been estimated to be in the range of 6.23–8.01×10-8cm2 s-1at room temperature. Charge/discharge performance using the static H-type electrochemical cell gives coulombic efficiencies near 50%. In comparison to results obtained with acetonitrile as a solvent, the DES seems to show similar performance (despite being cycled at least 12 times). This is encouraging because DES is safer to work with and significantly more environment friendly than acetonitrile.

Biography

Laleh Bahadori is doing her PhD degree in Chemical Engineering at University of Malaya, Kuala Lumpur, Malaysia. She is currently working as a research assistant in the scientific sector of Materials Science, Electrochemistry and Energy at the University of Malaya.

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