

Electronic Supplementary Information (ESI)

New ionic liquids based on complexation of dipropylsulfide and AlCl_3 for electrodeposition of aluminum

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Materials and experiments

Granular AlCl_3 was purchased from Sigma-Aldrich and used as received. Dipropyl sulfide (DPS) was obtained from TCI chemical company. In Ar-filled glovebox, a desirable amount of AlCl_3 is added into DPS in a sealed vessel with a magnetic stirring bar. The reaction is slightly exothermic so it is not necessary to heat the vessel to accelerate the dissolution of AlCl_3 .

The differential scanning calorimetry (DSC) profile was acquired from NETZSCH (STA 409 PC) under argon environment. The mass spectrum analyses were performed using a JEOL AccuTOF-D time-of-flight (TOF) mass spectrometer with a DART (direct analysis in real time) ionization source from JEOL USA, Inc. **Fourier transform infrared data were gathered from Perkin-Elmer Fourier-transform infrared frontier spectrophotometer.** The electrochemical experiment was performed on CHI600D electrochemical analyzer. SEM images are obtained by Hitachi S-4800 FEG scanning electron microscope with the EDS attachment.

For cyclic voltammetry, a clean platinum electrode (0.5 mm in diameter) was used as working electrode, with Al sheet and Al wire as the counter and reference electrode. For electrochemical plating, a polished and cleaned Cu strip was used as cathode with Al plate as the anode. The plating bath was held on a hot plate with temperature control and stirring.

Supplementary figure

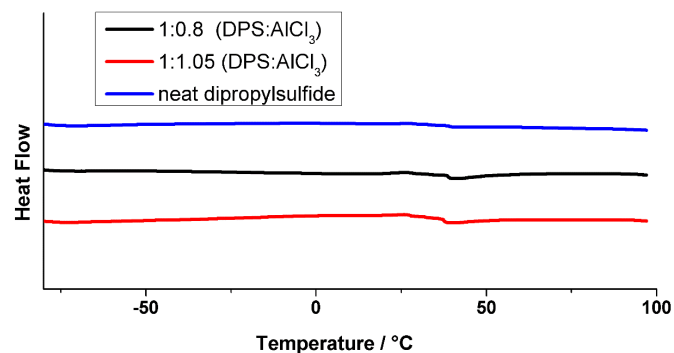


Figure S1 DSC thermograms of the ionic liquids with different ratios of DPS/ AlCl_3 at

a heating rate of 10 °C /min under nitrogen. (Note: the lines have been shifted perpendicularly for clarity).