

材料工程专栏

## Conductivities of AlCl<sub>3</sub>/Ionic Liquid Systems and Their Application in Electrodeposition of Aluminium

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**摘要** Solubilities and conductivities of anhydrous AlCl<sub>3</sub> in six kinds of ionic liquids (ILs) were measured. Among the six kinds of ILs [bmim]Cl, [bmim]Br, [bmim]BF<sub>4</sub>, [bmim]PF<sub>6</sub>, [emim][EtSO<sub>4</sub>] and [bmim][HSO<sub>4</sub>], anhydrous AlCl<sub>3</sub> could be dissolved in the first five kinds but was hardly dissolved in [bmim][HSO<sub>4</sub>]. The results showed that the nominal solubilities of AlCl<sub>3</sub> in ILs increased in the order of [bmim][HSO<sub>4</sub>] < [bmim]PF<sub>6</sub> < [emim][EtSO<sub>4</sub>] < [bmim]BF<sub>4</sub> < [bmim]Cl < [bmim]Br. Conductivities of the AlCl<sub>3</sub>/ILs systems depended apparently on the nominal molar ratio of AlCl<sub>3</sub> to ILs. The conductivities of AlCl<sub>3</sub>/[bmim]Cl, AlCl<sub>3</sub>/[bmim]Br and AlCl<sub>3</sub>/[bmim]PF<sub>6</sub> systems had a similar tendency as a function of the nominal molar ratio, that is, as the molar ratio was increased, conductivities increased first and then decreased, with the maximum conductivity obtained at approximately 0.9:1, 1.0:1 and 0.5:1, respectively. Conductivities of the AlCl<sub>3</sub>/[bmim]BF<sub>4</sub> exhibited a dentate change and decreased with the molar ratio of AlCl<sub>3</sub> to [bmim]BF<sub>4</sub> increasing in general. With the increasing of the anhydrous AlCl<sub>3</sub> amount in [emim][EtSO<sub>4</sub>], conductivity of AlCl<sub>3</sub>/[emim][EtSO<sub>4</sub>] monotonically decreased. AlCl<sub>3</sub>/[bmim]Cl system was chosen as the electrolyte for the electrodeposition of Al. Preliminary experimental results showed that dense, adherent and homogeneous Al coatings could be electrodeposited on stainless steel by means of constant potential technique and the surface coverage was quite satisfactory.

**关键词** [ionic liquid](#) [AlCl<sub>3</sub>](#) [solubility](#) [conductivity](#) [electrodeposition of aluminium](#)

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