

# Electrochemical Deposition of Aluminum at Vitreous Carbon in a Room-Temperature Molten Salt

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The electrochemical deposition of aluminum on vitreous carbon has been studied in the aluminum chloride : 1-ethyl-3-methylimidazolium (EMIC) molten salt system. Deposition characteristics have been investigated in acidic melts, in which there is a molar excess of aluminum chloride over EMIC, and neutral buffered melts, in which sodium chloride has been added to a formerly acidic melt.

In 1.2 : 1.0 acidic melts, reduction of aluminum at -0.25 V (peak potential for reduction process) results in nonuniform coverage by aluminum for passage of 6 mC charge at a 0.07 cm<sup>2</sup> vitreous carbon electrode. Although this charge corresponds to roughly 200 atomic layers of aluminum, SEM studies have shown that rather impure aluminum deposits occupy only a small fraction of the electrode surface under these conditions. Chronoamperometric studies have shown that the deposited aluminum can be nearly quantitatively removed by a potential excursion to +0.50 V. Continuous deposits of aluminum are obtained when higher charges (800 mC) are used. These results are in general agreement with behavior observed at carbon surfaces in other work (1,2).

In neutral buffered melts, previous work has shown that aluminum deposition at platinum is possible (3), which is a consequence of the small concentration of Al<sub>2</sub>Cl<sub>7</sub><sup>-</sup> existing under these conditions. At vitreous carbon electrodes, multiple oxidation peaks are observed after reduction at potentials more negative than -1.0 V, possibly due to surface characteristics of the carbon electrodes.

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## References

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