



SURFACE VEHICLE RECOMMENDED PRACTICE

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(R) Measuring Properties of Li-Ion Battery Electrolyte

RATIONALE

As the market for lithium-ion batteries continues to grow, new electrolyte concepts are being proposed for incorporation into these batteries. A variety of physical and chemical properties can be measured with a variety of testing methodologies. This SAE Recommended Practice provides a set of test methods to characterize lithium-ion battery electrolytes. These methods can enable comparisons of supplier materials to assure a consistent and fair analysis for sourcing selection. Pass/fail criteria is not included in this document, as it is the decision of each manufacturer to establish their limits for desired material properties.

INTRODUCTION

Most electrolytes are composed of solvents and salts. Through optimized composition of solvents and salts, batteries can achieve good low-temperature performance and high power. Ionic liquids are beginning to be used in addition to, or as a replacement for, solvents. Ionic liquids enable improved performance for flammability issues. Additives are used to extend cycle life and enhance safety. In addition, additives can improve the interface on the cathode and/or anode surface.

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1. SCOPE

This SAE Recommended Practice provides a set of test methods for characterizing lithium-ion battery electrolytes. These test methods are applicable to existing electrolyte materials and allow different facilities to conduct testing in a common manner.

Solid electrolytes are expected to be commercially used for large scale batteries in the future. However, characterizing solid electrolytes may require methods different from those contained in this document. Such methods are not addressed in this document.

It is not within the scope of this document to establish acceptance criteria for test results, as this is usually established between the vendor and customer. It is also not within the scope of this document to examine the electrochemical properties of an electrolyte, since these are influenced by electrolyte composition. In addition, establishing an electrolyte composition appropriate for all applications is not feasible.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1715/2 Battery Terminology

2.1.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

DIN EN ISO 3104:1999-12 Determination of Kinematic Viscosity and Calculations of Dynamic Viscosity of Transparent and Opaque Liquids

2.1.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D445-17a Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

ASTM D618-13 Standard Practice for Conditioning Plastics for Testing

ASTM D664-17a Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration

ASTM D891-18 Standard Test Methods for Specific Gravity, Apparent, of Liquid Industrial Chemical

ASTM D1125-14 Standard Test Methods for Electrical Conductivity and Resistivity of Water

ASTM D1209-05 Standard Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)

ASTM D4052-18 Standard Test method for Density, Relative Density and API Gravity of Liquids by Digital Density Meter

ASTM D4447-15 Standard Guide for Disposal of Laboratory Chemicals and Samples

