

Conductivities of Room Temperature Molten Salts Containing ZnCl_2 , Measured by a Computerized Direct Current Method

Hsin-Yi Hsu and Chao-Chen Yang

Graduate School of Engineering, Science and Technology, National Yunlin University of Science and Technology, 123 University Road, Sec. 3, Touliu, Yunlin, Taiwan 640, R. O. C.

Reprint requests to Prof. C.-C. Y.; Fax: 886-5-531-2056; E-mail: yangcc@flame.yuntech.edu.tw

Z. Naturforsch. **57 a**, 129–135 (2002); received December 18, 2001

The conductivities of the binary room-temperature molten salt (RTMS) systems ZnCl_2 -N-n-butylpyridinium chloride (BPC), ZnCl_2 -1-ethyl-3-methylimidazolium chloride (EMIC) and ZnCl_2 -benzyltriethylammonium chloride (BTEAC) have been measured at different temperatures and compositions by a d.c. four-probes method. The conductivities of the three RTMS are in the order ZnCl_2 -EMIC > ZnCl_2 -BPC > ZnCl_2 -BTEAC.

In ZnCl_2 -BPC the conductivity at 70 to 150 °C, is maximal for 40 mol% ZnCl_2 . In ZnCl_2 -EMIC, the conductivity below 130 °C is almost constant for 30 to 50 mol% ZnCl_2 and has the lowest activation energy 25.21 kJ/mol. For these two systems, the conductivities decrease rapidly beyond 50 mol% ZnCl_2 owing to the rapid increase in cross-linking and resultant tightening of the polyelectrolyte structure. As to the ZnCl_2 -BTEAC system, the conductivities at 110 - 150 °C decrease slowly for 30 - 60 mol% ZnCl_2 . The conductivities of the ZnCl_2 -EMIC melt are compared with those of the AlCl_3 -EMIC melt previously studied.

The stability of the ZnCl_2 -EMIC melt system is explored by the effect of the environment on the conductivity and the Far Transmission Infra Red (FTIR) spectrum. It reveals that the effect is slight, and that the ZnCl_2 -EMIC melt may be classified as stable.

Key words: Conductivity; Room-temperature Molten Salt; ZnCl_2 ; Direct Current Method;
Stable Melt.