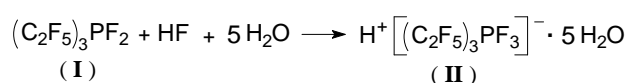


New Hydrophobic Ionic Liquids (Molten Salts) with Highly Fluorinated Anions. Synthesis and Properties.

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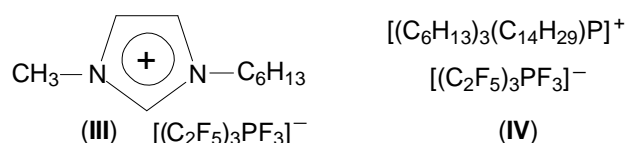
Commonly used ionic liquids with the hexafluorophosphate, PF₆⁻ anion (hydrophobic) are hydrolytically unstable, especially by heating [1]. Recently Merck KGaA (Darmstadt, Germany) has developed convenient synthesis of hydrophobic ionic liquids with tris(perfluoroalkyl)trifluorophosphate (FAP) - anion [2,3], as replacement for PF₆⁻.

Preparation of the ionic liquids with FAP – anion is based on the use of tris(perfluoroalkyl)trifluorophosphoric acid of type (I) or its alkali-metal salts.

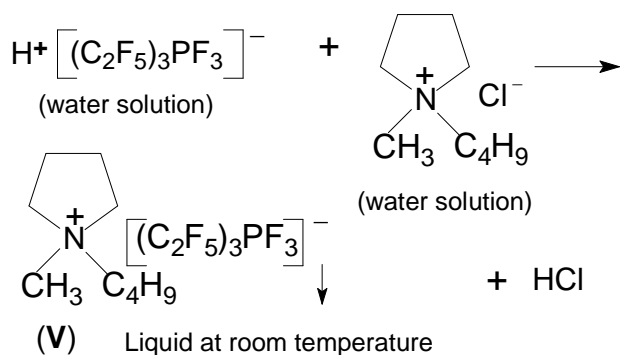


Phosphorane (I) can be produced by well established industrial method - electrochemical fluorination (ECF) in anhydrous HF.

The aqueous solution of acid (II) is stable at room temperature for a long time and can be used as a convenient starting material for the preparation of different salts containing the tris(perfluoroalkyl)trifluorophosphate-anion (FAP-anion) for application as a new ionic liquids and conducting salts, for example:



The synthesis of room temperature molten salts with FAP-anion can be carried out in water.



HMIM FAP (III) can be obtained with a very low content of chloride and residual water (10-15 ppm). HMIM FAP (III) is a hydrophobic room temperature ionic liquid, which possesses high hydrolytic stability (no HF formation after 5 hours boiling in water) and large electrochemical window (more than 5.5 V). Viscosity (mm²/s) of HMIM FAP (III) is: 74.3 (20°C), 29.8 (40°C), 14.8 (60°C), 8.4 (80°C).

Tetrafluoroborate, BF₄⁻ anion can be modified in the same way. The introduction of perfluoroalkyl-groups to boron makes the room temperature molten salts with perfluoroalkyl-trifluoroborate-anion hydrophobic and increase its electrochemical stability. Recently Merck KGaA (Darmstadt, Germany) has developed new method of synthesis of the ionic liquids with perfluoroalkyltrifluoroborate-anion [4].

The electrochemical properties (conductivity and electrochemical stability) of new ionic liquids (room temperature molten salts) will be discussed.

References.

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2. M. Schmidt, U. Heider, W. Geissler, N.V. Ignatyev, V. Hilarius, EP 1 162 204 (Merck KGaA, Darmstadt, Germany).
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4. Patent Application (Merck KGaA, Darmstadt, Germany).