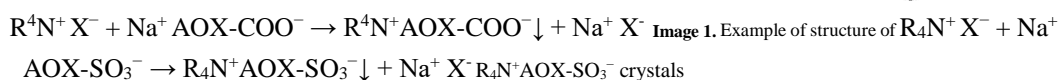
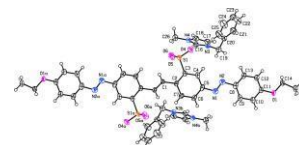


Application of ionic liquids for separation of halogenated aromatic acids from aqueous effluents

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1. Introduction – Cheap ionic liquids (Arquad 5HT, benzalkonium chloride, Aliquat 336, Luviquat Mono LS, etc.) produced in bulk quantities were successfully verified for isolation of halogenated aromatic acids or their salts from aqueous solutions. Their action was compared with efficiency of usually used ionic liquids, typically RMIM salts. The isolation of mentioned chlorinated acids is based on ion-exchange between bulky quaternary ammonium cation and anion of aromatic sulfonic (AOX-SO₃H) or carboxylic (AOX-COOH) acid according to the equation (example of structure of obtained R₄N⁺AOX-SO₃⁻ is depicted in Image 1):



This technique was used for treatment of aqueous effluents contaminated obtained by action of BzMIMCl on with biocidal chlorinated compounds from production of specialty organic Chrysophenine fine chemicals. Separated chlorinated biocides were treated with chemical reduction producing low-weight biodegradable organic anions enabling subsequent recycling of used ionic liquids.

Effect of cation size (number of long alkyl chains bonded on quaternized nitrogen cation of) of ionic liquid R₄N⁺ X⁻ and size of anion AOX-SO₃⁻ on efficiency of ion exchange with halogenated aromatic acids was studied. The separation efficiency of chlorinated acid dye Mordant Blue 9 used as the probe was studied by measurement of distribution coefficient between 1-octanol and water phases. The measurement proved that the efficiency of removal of halogenated aromatic acid or its salt from aqueous solution using low-melting quaternary ammonium salt as liquid ion-exchanger increase with number of bulky alkyl groups bonded on central quaternized nitrogen cation and it is in good correlation with increase of hydrophobicity of produced ion pairs R₄N⁺AOX-SO₃⁻.

2. Results and Discussion – According to the experiments, the cheap industrially produced Aliquat 336 was sorted and tested for removal of mentioned chlorinated acids from model waste water. Attempts to recycle the used Aliquat 336 were made using Al-Ni in alkaline aqueous alcohol solution and products were analysed using LC-MS spectroscopy.

3. Conclusions – The most effective Aliquat 336 ionic acid is fully recyclable for this mentioned separation technique via catalytic hydrodechlorination of AOX-COO⁻ or AOX-SO₃⁻ using Al-Ni alloy.