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LETTERS TO THE EDITOR

Protic Ionic Liquids Based on 1,1-Dimethylhydrazine and Arylheteroacetic Acids

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Previously we have performed the reaction of biogenic (2-hydroxyethyl)amines with the biologically active arylheteroacetic acids to give the solid salts, which have a structure of the protic ionic liquids Ar(Het)$XCH_2COO^-\cdot HN^+R_n(CH_2CH_2OH)_{3-n}$; X = O, S, SO_2; n = 0–2. They are the pharmacologically active substances of low toxicity (LD_{50} 1300–6000 mg kg^{-1}) possessing anti-aggregatory, membrane stabilizing, anti-sclerotic, immunomodulatory, antitumor, adaptogenic, and other activities [1–7].

In order to obtain the new biologically active ionic liquids we carried out the reaction of arylheteroacetic acids with 1,1-dimethylhydrazine.

$$Me_2N–NH_2 + HO(O)CCH_2XR \rightarrow [Me_2N^+H–NH_2]\cdot O^-(O)CCH_2XR,$$

X = O, R = 2-$CH_3C_6H_4$ (**I**); X = S, R = 4-ClC_6H_4 (**II**); X = SO_2, R = 4-ClC_6H_4 (**III**); X = S, R = Ind (**IV**).

Compounds **I**–**IV** are viscous liquids, very well soluble in water and poorly soluble in ether and alcohols. The structure of the obtained compounds was confirmed by the NMR ^1H, ^{13}C, ^{15}N and IR spectroscopy methods.

The selection of dimethylhydrazine (a tonnage toxic component of rocket fuel) was underlain by the fact that its quaternization involving Me_2N group [8, 9] results in non-hazardous compounds with high antimicrobial, antifungal, and anti-cardiotropic activities, comparable with the effect of pharmaceuticals [10, 11]. The combination of arylheteroacetic acids and dimethylhydrazine properties in one molecule offers great opportunities for further investigation of the synthesized ionic liquids.

1,1-Dimethylhydrazinium 2-methylphenoxyacetate (I). To an alcohol solution of 1.662 g (0.01 mol) of 2-$CH_3C_6H_4OCH_2COOH$ was added dropwise 0.601 g (0.01 mol) of dimethylhydrazine while stirring and heating at 45°C for 15 min. The solvent was distilled off. The oily residue was washed several times with diethyl ether and dried in a high vacuum. Yield 2.20 g (97%). IR spectrum, ν, cm^{-1}: 1591 (C=O), 2521–2796 (N^+H), 3158, 3308 (NH_2). ^1H NMR spectrum, δ_H, ppm: 7.11–6.77 m (4H, Ph), 4.54 s (2H, $PhOC\underline{H_2}$), 3.32 s (2H, NH_2), 2.87 s (6H, NMe_2). ^{13}C NMR spectrum, δ_C, ppm: 174.05 (C=O), 130.337–111.10 (Ph), 66.32 ($PhOCH_2$), 46.06 (NMe_2), 15.17 ($PhCH_3$). ^{15}N NMR spectrum, δ_C, ppm: –257.5 (NMe_2), –286.0 (NH_2).

1,1-Dimethylhydrazinium 4-chlorophenylsulfanylacetate (II) was obtained similarly from 4-$ClC_6H_4\cdot SCH_2COOH$ and dimethylhydrazine. Yield 91%. IR spectrum, ν, cm^{-1}: 1574 (C=O), 2518–2741 (N^+H), 3268, 3389 (NH_2). ^1H NMR spectrum, δ_H, ppm: 7.72–7.38 m (4H, Ph), 3.40 s (2H, SCH_2), 3.22 t (2H, NH_2), 2.79 s (6H, NMe_2). ^{13}C NMR spectrum, δ_C, ppm: 175.18 (C=O), 136.76–110.00 (Ph), 57.65 (SCH_2), 40.44 (NMe_2).

1,1-Dimethylhydrazinium 4-chlorophenylsulfonylacetate (III) was obtained similarly from 4-$ClC_6H_4\cdot SO_2CH_2COOH$ and dimethylhydrazine. Yield 92%. IR spectrum, ν, cm^{-1}: 1581 (C=O), 2588–2770 (N^+H), 3169, 3330 (NH_2). ^1H NMR spectrum, δ_H, ppm: 7.87–7.57 m (4H, Ph), 4.47 s (2H, $SO_2C\underline{H_2}$), 3.20 t (2H, NH_2). 2.81 s (6H, NCH_3). ^{13}C NMR spectrum, δ_C, ppm: 177.08 (C=O), 137.96–111.11 (Ph), 67.65 (SO_2CH_2), 44.44 (NMe_2).

1,1-Dimethylhydrazinium indole-3-yl-sulfanylacetate (IV) was obtained by analogy from the indole-3-ylsulfanylacetic acid and dimethylhydrazine. Yield 93%. IR spectrum, ν, cm^{-1}: 1574 (C=O), 2600–2790 (N^+H), 3200, 3333 (NH_2). ^1H NMR spectrum, δ_H, ppm: 7.71–7.11 m (5H, Ind), 3.39 s (2H, SCH_2), 3.22 t (2H, NH_2). 2.78 s (6H, NMe_2). ^{13}C NMR spectrum, δ_C, ppm: 175.18 (C=O), 136.76–103.86 (Ind), 57.18 (SCH_2), 40.44 (NMe_2).

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