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LETTERS TO THE EDITOR

Reactions of Amino Acids with Arylchlorophosphoranes and Chlorophosphonium Compounds

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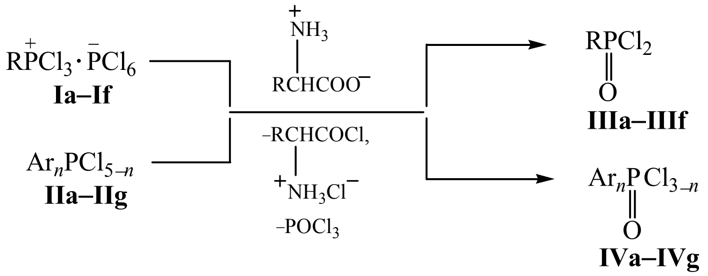
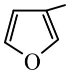
It is known that one of the general and accessible synthesis methods for organylphosphonic acids dichloride, which are the key compounds of organophosphorus synthesis [1], is the reaction of chlorophosphonium compounds **I** (adducts of alkenes with phosphorus pentachloride) and organylchlorophosphoranes **II** with various oxygen-containing compounds [2]. In the development of this method the use of the reagents with different nucleophilic centers as the transformers of chlorides **I** and **II** into organyldichlorophosphonates is promising. We have shown that amino acids can be used as such compounds.

The reactions of organyltrichlorophosphonium hexachlorophosphates **Ia**–**If** and chlorophosphoranes **IIa**–**IIg** with amino acids were carried out at a molar ratio of reagents 1:(2–1). The reaction proceeds rapidly at 20–25°C for 0.1–0.2 h. The amino acid chloride hydrochlorides formed as yellow-orange solutions or precipitates. The composition of compounds was confirmed by the qualitative and quantitative analysis, and also by the data of infrared spectra, which contain the absorption bands of stretching and bending vibrations of C=O (1716–1736 cm^{-1}) and N–H bonds (3150–3305, 1610–1658 cm^{-1}).



Ia–**If**, **IIIa**–**IIIf**: R = $C_6H_5CH{=}CH$ (**a**), $C_6H_5C(CH_3){=}CH$ (**b**), $C_2H_5OCH{=}CH$ (**c**), $C_4H_9CHClCH_2$ (**d**), $C_5H_{11}CHClCH_2$ (**e**),  (**f**);

IIa–IIg, IVa–IVg: $n = 1$, Ar = C_6H_5 (**a**), $4\text{-}CH_3C_6H_4$ (**b**), $4\text{-}FC_6H_4$ (**c**), $4\text{-}ClC_6H_4$ (**d**), $C_6H_5CH{=}CH$ (**e**); $n = 2$, Ar = C_6H_5 (**f**), $C_6H_5CH{=}CH$ (**g**).

After the precipitate separation, the filtrate was distilled to yield organylphosphonic dichlorides **IIIa**–**IIIf**, **IVa**–**IVe** and diarylphosphinic acids chlorides **IVf**, **IVg**.

The structure of compounds **IIIa**–**IIIf** and **IVa**–**IVg** was confirmed by the IR and ^{31}P NMR spectroscopy, and the composition, by the elemental analysis. Thus, the IR spectrum of styryldichlorophosphonate **IIIe** contains the characteristic absorption bands of stretching vibrations of C=C, P=O, and P–Cl bonds at 1600, 1265, 565, 512 cm^{-1}, respectively. Vibrations of the aromatic ring appear as characteristic bands of the C–H and C–C bonds. In the ^{31}P NMR spectrum there is a signal of phosphorus atom at δ_P 33 ppm.

The IR spectra were recorded on an infrared Fourier spectrometer FSM-1202 (KBr prisms, thin films), and the ^{1}H NMR spectrum, on a Bruker WM-250 (250 MHz) instrument relative to internal reference dimethyl sulfoxide, the solvent $(CD_3)_2SO$. The ^{31}P NMR spectrum was registered on a Bruker WP-80 instrument (32.44 MHz) with external reference 85% phosphoric acid.

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