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Fluorescent and growth-regulating activity 2-phenylethenylphosphonic acid derivatives

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Abstract

The paper provides data on an improved method for the synthesis of 2-phenylethenylphosphonic acid dichloride by interacting of carbamide derivatives with 2-phenylethenyltrichlorophosphonium hexachlorophosphate, which is an intermediate adduct of the reaction of styrene and phosphorus pentachloride. Readily available urea, biuret, and acetylurea have been used as transformers of the adduct. It has been shown that carbamide derivatives are not only donors of the oxygen atom, but they also bind hydrogen chloride released at the stage of complexation into the corresponding hydrochlorides. This allows obtaining the target 2-phenylethenyldichlorophosphonate without admixture of the hydrochlorination by-product. The phenomenon of induced fluorescence of 2-phenylethenylphosphonic acid and its esters in the solid phase and in solution was revealed. The growth-regulating activity of 2-phenylethenylphosphonic acid and *O,O*-di(*p*-nitrophenyl)-2-phenylethenylphosphonate on the seed germination energy, laboratory and field germinations of grain and vegetable crops was established. It is shown that pre-sowing treatment of the Prokhorovka spring wheat seeds with a 0.0005% aqueous solution of *O,O*-di(*p*-nitrophenyl)-2-phenylethenylphosphonate leads to an increase in wheat yield by 21%, which expands the range of products for this purpose. A study of the acute toxicity of 2-phenylethenylphosphonic acid according to *LeBlanc* on male rats kept on a standard vivarium diet showed that it has a two-phase effect. In the first phase, there are symptoms of damage to the motor part of the peripheral nervous system in the form of local seizures and the central nervous system in the form of the general suppression of motor activity and moderate relaxation of skeletal muscles, and in the second phase, the acid manifests itself in a general toxic effect. Determination of the LD_{50} of 2-phenylethenylphosphonic acid showed that it belongs to the third class of toxicity – low-hazard substances.

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