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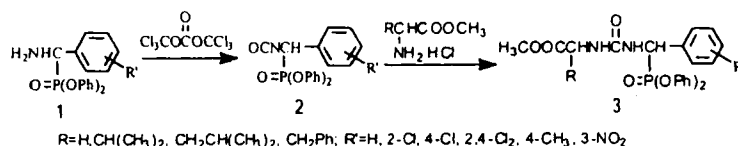
The Synthesis of Phosphorus Analogues of Hydantoic Acid

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Hydantoic acids have attracted much attention due to their good fungicidal, herbicidal activities and low toxicity for fish and warm-blooded animals.^[1] In this paper, some substituted ureidoalkyl-phosphonates **3**, the phosphorus analogues of hydantoic acids, are synthesized.

The reported method for synthesis of ureidoalkylphosphonates is limited to the P-Mannich type reaction of substituted ureas, aldehyde and phosphite^[2]. In this paper, a novel method for synthesis of ureidoalkyl-phosphonates is reported (Scheme I). The easily accessible α -aminoalkyl-phosphonic acid diphenyl esters **1** were converted to **3** with high yields (86-96%) by treated with triphosgene and amino acid methyl ester hydrochlorides consequently in one pot.



Scheme I

In the synthetic procedure, the intermediates α -isocyanatoalkylphosphonic acid diphenyl esters **2** are observed (IR.: $\nu_{\text{NCO}} \sim 2240\text{cm}^{-1}$) after the treatment of **1** with triphosgene. Using this method, a large variety of substituted ureidoalkylphosphonic acid diphenyl esters are prepared in good yields.

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