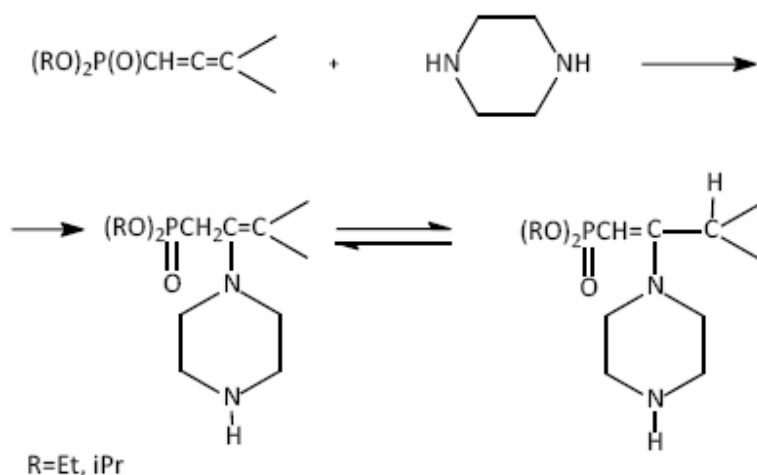


Synthesis of the Phosphorylated Piperazines

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Interest in the synthesis of polyfunctional organophosphorus compounds originates from wide prospects in their practical application. Allenes, due to their unique reactivity, are important and versatile building blocks in the construction of various compounds with multifunctionalities. Herein we report the results of our study on the reaction of 3-methyl-but-1,2-dienylphosphonates with piperazine.



Scheme

The heating of these reagents in the presence of $RONa$ leads to the formation of the thick addition products, which in $CDCl_3$ have the structure of the mixture of the tautomeric enamines (Scheme). The structure of enamines was investigated by 1H , ^{31}P and IR spectroscopy. The interaction two divisible abundance of 3-methyl-but-1,2-dienylphosphonates with piperazine leads to formation of bisphosponates, whose molecules consist of two phosphorylbutene groups symmetrically linked to each other by the piperazine bridge.

It was established, that the reaction of 3-methyl-but-1,2-dienylphosphonates with 2-aminoethylpiperazine involves the addition of primary exocyclic amino-group to the *sp*-hybridized C-atom cumulene and leads also accordingly to the mixture of the tautomeric enamine