Phosphoric Trichloride

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Introduction

Phosphoric trichloride is a colorless, clear and transparent irritating liquid. Its structure is a tetrahedral consisting of one P=O double bond and three P–Cl bonds. POCl₃ reacts with alcohols to produce alkyl phosphate esters and is therefore a versatile phosphating agent. As a selective and inexpensive reagent giving high yields in simple operations under mild conditions, it is tremendously used in organic synthesis, for example, in chlorination, regiospecific dehydration and ring-closing reactions. Its use has been reported in several types of name reactions, for example, in the Bischler–Napieralski and Vilsmeier–Haack reactions.

Abstracts

(A) The Bischler–Napieralski reaction has been widely used to prepare feature heterocycles of numerous natural products and related compounds. In the total syntheses of schulzeines B and C, Gurjar and co-workers employed POCl₃ for the formation of isoquinoline.

(B) Shing and co-workers have described the mild quantitative regiospecific elimination of the tertiary alcohol with POCl₃ affording the enone.

Figure 1 Phosphoric trichloride
(C) The Vilsmeier reagent (DMF/POCl₃) was used to efficiently and directly synthesize polyfunctionalized unsaturated 6-lactams via cyclization–haloformylation.

(D) Groth and co-worker reported the total syntheses of kalasin-amide, geovamine and marcanine A. During the second key step, after optimization, the yield of cyclization and chlorination of a malonic acid amide in presence of POCl₃ is 85%.

(E) The title reagent and triethylamine can converse commercially available trans-4-aminocyclohexanol to the corresponding cyclodehydration product in 54% yield under mild condition.

References