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Spotlight 170

This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

Cyanuric Chloride: Trichloro-1,3,5-triazine

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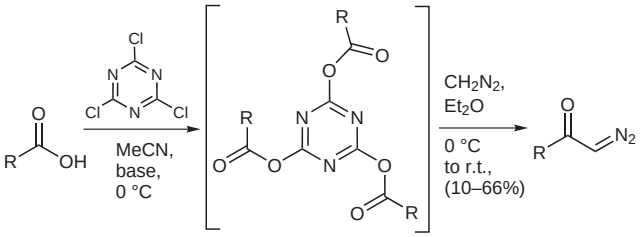
Introduction

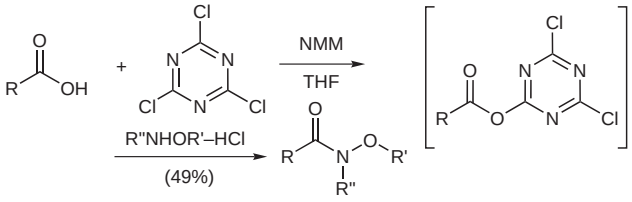
Trichloro-1,3,5-triazine (cyanuric chloride) has been known since 1827. It has occupied an important place in organic synthesis because of its easy availability, low cost and clean selective reactions. It is commercially available and can also be conveniently synthesized by trimerization of cyanogen chloride.[1] The reactivity of cyanuric chloride with amines, alcohols, thiols and phenols has been widely put to use[2] in the synthesis of dyes, herbicides, insecticides, fungicides, pesticides, drugs and in the preparation of immobilized enzymes, a new class of polypode ligands and chiral stationary phases for GLC and HPLC. It has also been used for the synthesis of N-protected chiral α-aminonitriles,[3] as a mild reducing agent for carboxylic acids to alcohols,[4] in the synthesis of 4-(4,6-dimethoxy[1,3,5]triazin-2-yl)-4-methylmorpholinium chloride (DMTMM),[5] dendrimers,[6] macrocyclic scaffolds,[7] as a mild and efficient alternative to the classical Swern oxidation,[8] in the preparation of acyl azides,[9] acyl chlorides[10] and chiral monochloro-s-triazine reagents for liquid chromatographic separation of amino acid enantiomers.[11] 2,4,6-Trisubstituted triazines have been used as antimalarial and antibacterial agents.[12] Recently, cyanuric chloride has been used for the synthesis of cyanuric acid bridged porphyrin–porphyrin dyads,[13] calixarenes[14] and benzoxazinones.[15]

Abstracts

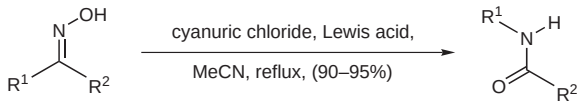
(A) Cyanuric chloride is an excellent coupling reagent for the efficient transfer of diazomethane to a carboxylic acid. Preparation of diazoketones using carboxylic acids and the triazine reagent is considerably more convenient than classical diazo transfer protocols.[16]



(B) Cyanuric chloride has been used in an easy and convenient synthesis of Weinreb amides and hydroxamates.[17]



(C) Cyanuric chloride is a highly effective catalyst for the organocatalytic Beckmann rearrangement under reflux in acetonitrile or nitromethane.[18]



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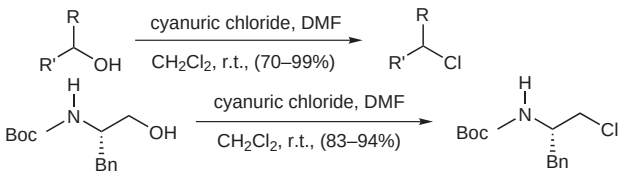
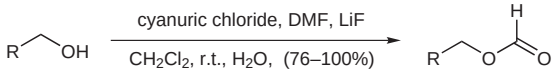
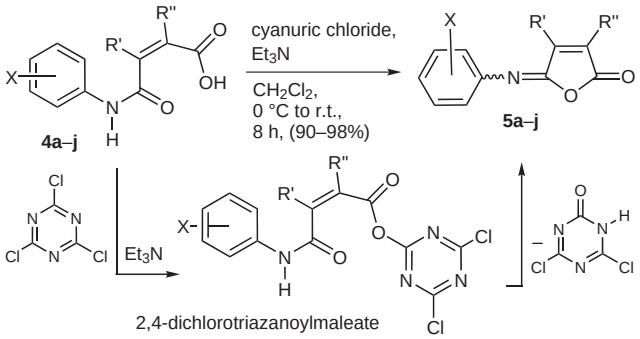
(D) Efficient conversion of alcohols and β-amino alcohols to the corresponding chlorides (and bromides) can be carried out at room temperature in methylene chloride, using cyanuric chloride and *N*,*N*-dimethyl formamide. This procedure can also be applied to optically active carbinols.[19]



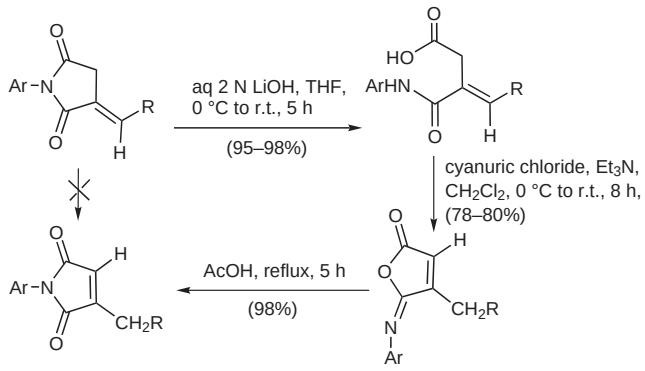
(E) Efficient conversion of primary alcohols to the corresponding formate esters can be carried out at room temperature in methylene chloride, using cyanuric chloride and *N*,*N*-dimethyl formamide in the presence of lithium fluoride. This is a useful method for selectively protecting primary hydroxyl groups.[20]



(F) Starting from maleanilic and maleamic acids, recently we have reported a facile general approach to kinetically controlled isomaleimides using cyanuric chloride as a decent dehydrating agent with 85–95% yields.[21]



(G) Very recently, simple and efficient access to alkyl- and dialkyl-substituted maleimides has been demonstrated by us using cyanuric chloride as a dehydrating agent via the new contrathermodynamic rearrangement of (*E*)-alkylidinesuccinimides to alkylmaleimides.[22]



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