SYNLETT
Spotlight 284

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

Potassium Thiocyanate (KSCN): A Versatile Reagent

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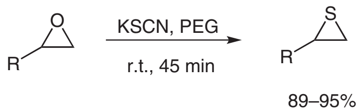
Introduction

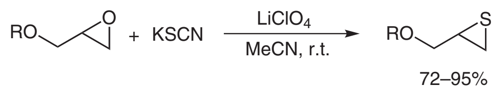
Potassium thiocyanate (KSCN) is a white odorless, crystalline powder, slightly hydroscopic, and commercially available reagent. It is readily soluble in water and stable under normal temperature and pressure (mp: 173 °C, d = 1.89 g/cm^3). Since sulfur-containing groups serve as an important auxiliary function in synthetic sequences,[1] potassium thiocyanate is widely used as a transfer reagent for sulfur in various organic transformations.[2] The hypervalent iodine(III) in combination with potassium thiocyanate and diphenyl diselenide promoted a multicomponent reaction for the synthesis of phenylselenyl thiocyanates and isothiocyanates from alkenes.[3] Various tosyl and bromo derivatives of Cbz-, Boc-, and Fmoc-protected threonine methyl esters have been subjected to nucleophilic substitution with potassium thiocyanate in acetonitrile for the synthesis of allo- and threo-3,3′-dimethylcystine derivatives.[4] This reagent is supported on silica gel and applied for thiocyanation of β-dicarbonyl compounds and the synthesis of 2-aminothiazoles.[5] Recently, potassium thiocyanate is used for the conversion of alkyl halides into alkyl thiocyanate in water under phase-transfer catalysis.[6] It is also employed for the synthesis of 1-aroyl-3-(substituted-2-benzothiazolyl)thioureas with antibacterial properties.[7]

Abstracts

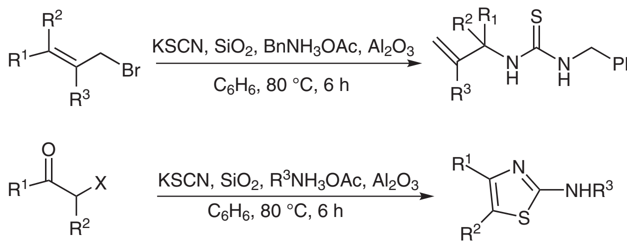
(A) Das et al.[8] reported an efficient and catalyst-free procedure for the synthesis of thiiranes from oxiranes by treatment with KSCN using PEG as a reaction medium at room temperature.



(B) In the presence of a catalytic amount of $LiClO_4$, oxiranes are converted into the corresponding thiiranes by potassium thiocyanate in nonaqueous condition.[9]



(C) Aoyama et al.[10a] introduced a supported reagent system, KSCN/SiO_2 and $BnNH_3OAc/Al_2O_3$, that has been employed in a one-pot synthesis of *N*-allylthioureas. Also, various α-halo ketones and allylic bromides were converted into 2-aminothiazoles and *N*-allylthioureas from commercially available materials in one pot by using the supported reagents.[10b]



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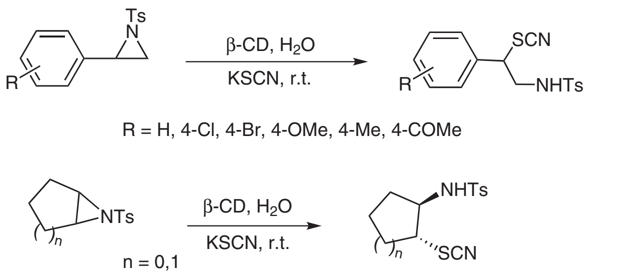
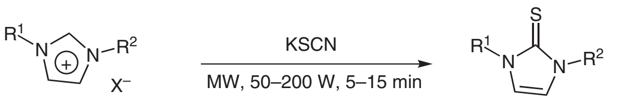
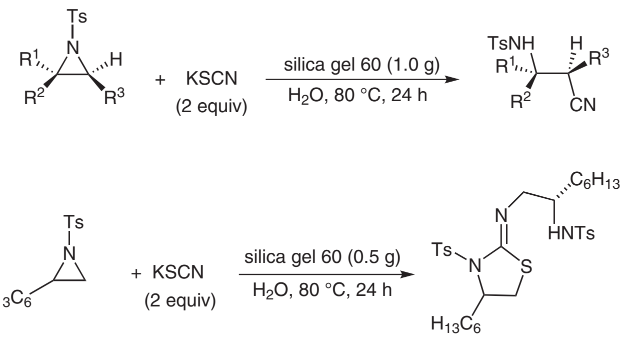
(D) Rao et al.[11] reported a mild and efficient method for the regioselective ring opening of aziridines with KSCN in the presence of β-CD as catalyst and water at room temperature with excellent yields ranging from 78 to 90%.



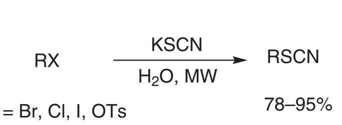
(E) Recently, a practical synthesis of 1,3-disubstituted imidazole-2-thiones via a microwave-promoted reaction of imidazolium salts with potassium thiocyanate or potassium thioacetate under solvent-free conditions has been developed.[12]



(F) Ring-opening reactions of various *N*-tosylaziridines with KSCN proceeded in a silica–water reaction medium in good yield with complete regioselectivity. The system is applicable to a ring expansion of an aziridine with potassium thiocyanate leading to a thiazolidine derivative.[13]



(G) The microwave-assisted nucleophilic substitution of potassium thiocyanate with different halides or tosylates in water has been developed and proved very successful with the formation of alkylthiocyanates in good to excellent yields. Noteworthy, no significant rearrangement to isothiocyanates was observed.[14]



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