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Synthesis of 5-Substituted 1H-Tetrazoles in Deep Eutectic Solvent

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Abstract : The chemistry of tetrazoles has been grown tremendously in the past few years because tetrazoles are important and useful class of heterocyclic compounds which have a widespread application such as anticancer, antimicrobial, analgesics, antibacterial, antifungal, antihypertensive, and anti-allergic drugs in medicinal chemistry. Furthermore, tetrazoles have application in material sciences as explosives, rocket propellants, and in information recording systems. In addition to this, they have a wide range of application in coordination chemistry as a ligand. Deep eutectic solvents (DES) have emerged over the current decade as a novel class of green reaction media and applied in various fields of sciences because of their unique physical and chemical properties similar to the ionic liquids such as low vapor pressure, non-volatility, high thermal stability and recyclability. In addition, the reactants of DES are cheaply available, low-toxic, and biodegradable, which makes them predominantly required for large-scale applications effectively in industrial production. Herein we report the [2+3] cycloaddition reaction of organic nitriles with sodium azide affords the corresponding 5-substituted 1H-tetrazoles in six different types of choline chloride based deep eutectic solvents under mild reaction condition. Choline chloride: ZnCl2 (1:2) showed the best results for the synthesis of 5-substituted 1 H-tetrazoles. This method reduces the disadvantages such as: the use of toxic metals and expensive reagents, drastic reaction conditions and the presence of dangerous hydrazoic acid. The approach provides environment-friendly, short reaction times, good to excellent yields; safe process and simple workup make this method an attractive and useful contribution to present green organic synthesis of 5-substituted-1H-tetrazoles. All synthesized compounds were characterized by IR, 1H NMR, 13C NMR and Mass spectroscopy. DES can be recovered and reused three times with very little loss in activity.

Keywords : click chemistry, choline chloride, green chemistry, deep eutectic solvent, tetrazoles
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