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Nano $NaSrBi_{(1-x)}Eu_xWO_6$ Catalyzed Synthesis of Substituted Benzoxazole in Aqueous Media

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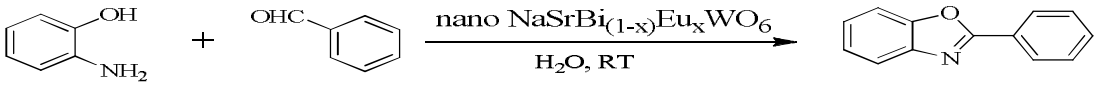
Abstract: ***A series of substituted Benzoxazole was synthesized by combining 2-aminophenol with aryl aldehydes in the presence of nano $NaSrBi_{(1-x)}Eu_xWO_6$ as an efficient heterogeneous catalyst in aqueous medium.***
Keywords: Nano $NaSrBi_{(1-x)}Eu_xWO_6$, Heterogeneous catalyst, Benzoxazole, Aqueous media

I. INTRODUCTION

Hetero aromatic -bicycles have an extensive variety of utilizations in medicinal chemistry due to their pharmaceutical and organic activities [1]. They are the critical basic intermediates in the syntheis of assortment of pharmaceutical, natural, and agrochemical compounds. These moieties are the piece of compounds demonstrating a few organic properties, for example, antihypertensive, antiulcer, antiviral, antifungal, anticancer, antihistamine, antihelminthic, antiparasitic, anticoagulant, antiallergic, pain relieving, calming, antimicrobial, and immunosuppressant.[2] Benzoxazoles derivatives are isosteres of normally happening cyclic nucleotides and they interface with the biopolymers of organisms.[3] These functionalized heterocycles additionally have different modern applications.[4] They go about as ligands for complexation with change metals which are utilized for displaying the natural framework in organic reactions.[5] The expansive utility has incited significant efforts toward the combination of these heterocycles. A few strategies were accounted for the synthesis of these heterocyclic moieties. To synhesis this compound, different catalysts were used.[6,8] Similarly the substituted benzoxazoles were likewise blended by a few methods.[7] Similarly benzoxazole is additionally combined by responding 2-aminophenol with carboxylic corrosive or aldehydes. In any case, a significant number of these reported techniques experience the ill effects of either disadvantages, for example, radical response conditions, long response time with poor yield, side product formation, utilization of lethal reagents and dangerous solvents, utilization of costly catalysts, and utilization of unreasonable oxidative catalysts. The vast majority of the revealed catalysts are homogeneous having no recyclability where as the responses completed with heterogeneous catalysts required non green solvents and higher temperatures. Consequently a greener route for the synthesis of benzoxazole is required. Nanometal oxides have higher reactant action because of high surface zone than their counter parts and because of this they have pulled in impressive consideration in natural blend. This demonstrates nano ceria isn't completely investigated for its reactant movement and subsequently with this foundation we have done the synthesis of hetero aromatic bi-cycles in aquesous medium by utilizing nano ceria. In this we report the buildup of 2-amino-phenol with aldehydes with the arrangement of benzoxazoles individually. Nano $NaSrBi_{(1-x)}Eu_xWO_6$ indicated huge recyclability and action for these responses by offering amazing to great productive yields.

The $NaSrBi_{(1-x)}Eu_xWO_6$ nano particles are set up by ultrasonically changed CTAB helped strategy. It is characterized by XRD, SEM, TEM, and EDAX spectra which are given in supporting data. The molecule size of nano $NaSrBi_{(1-x)}Eu_xWO_6$ acquired from TEM examination is 5–6 nm and the figured surface region was observed to be $201 m^2/g$. The reactions were done at room temperature and with water as dissolvable which are the vital contemplations of greener route of blend in natural science. As appeared in Figure 2, 2-aminophenol with benzaldehyde (Scheme 1) were chosen as model responses to explore reactant movement of nano $NaSrBi_{(1-x)}Eu_xWO_6$ in aqueous medium at room temperature. To grow the catalytic contemplate, we likewise screened an assortment of catalysts for the model reactions, for example, ZnO, TiO_2 , MnO_2, SiO_2, CeO_2, La_2O_3, Al_2O_3, nano Cu_2O, and nano ZnO and the outcomes are condensed in Table 1. The outcomes obviously show that nano $NaSrBi_{(1-x)}Eu_xWO_6$ is better than different catalysts because of the littler molecule size and high surface zone.



Scheme 1: Synthesis of 1,2-disubstituted benzoxazoles from 2-aminophenol and substituted benzaldehydes.

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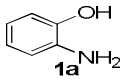
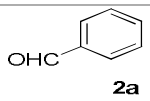
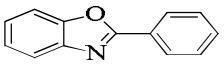
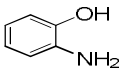
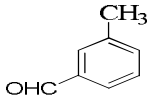
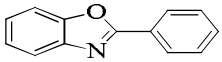
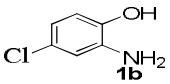
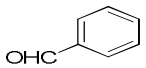
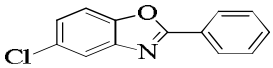
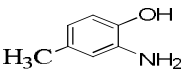
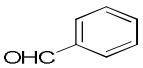
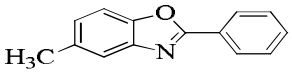
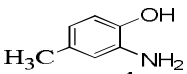
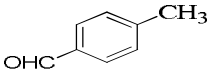
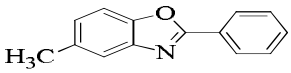
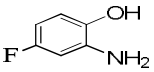
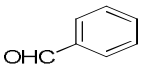
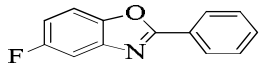
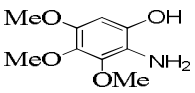
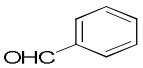
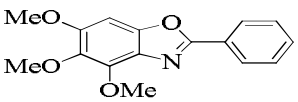
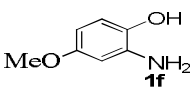
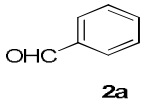
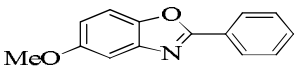
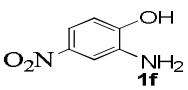
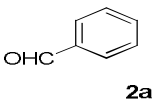
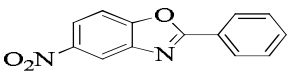
The model reactions were advanced for catalyst concentration and time. The results are appeared in Table 2 . 5 mol % of nano $NaSrBi_{(1-x)}Eu_xWO_6$ was adequate for most extreme product yields. An increment in catalyst fixation in excess of 5 mol % did not demonstrate viable increment in productive yields. The responses continued without catalyst yet with bring down yields, though 2 mol % catalyst stacking gave genuinely great yields. This undoubtedly demonstrates without catalyst, reaction did not work usefully. We additionally discovered the time required to finish the reaction. The required time would be 30, 20, and 20 min to get magnificent yield of products for the completion of reaction respectively. Recyclability of the catalyst is a critical task in industrial applications. Accordingly reusability of nano $NaSrBi_{(1-x)}Eu_xWO_6$ was researched for three cycles. The reaction mixture was diluted with ethyl acetic acid derivation and along these lines centrifuged to get the catalyst. The acquired nano $NaSrBi_{(1-x)}Eu_xWO_6$ was then washed with acetone took after by drying in broiler at 150°C for 12 h. The recouped catalyst was then utilized for the following bunch of reactions. It was discovered that the reactivity of the catalyst diminishes barely for the following cycle (approx 4%).

The scope and relevance of the catalyst in the arrangement of functionalized heterocycles were researched by utilizing different fragrant, heteroaryl, aliphatic, and unsaturated aldehydes under a similar response conditions. In the synthesis of benzoxazoles great yield of product have been acquired with aromatic aldehydes.

Table 1: Nano catalyzed synthesis of Benzoxazole derivatives in aqueous medium[a]

Entry	2-Aminophenol	Benzaldehyde	Product	Time(Sec)	Yield(%)[b]
1	 **1a**	 **2a**		25	95
2	 **1a**	 **2b**		30	92
3	 **1b**	 **2a**		30	91
4	 **1c**	 **2a**		30	87
5	 **1c**	 **2c**		40	90
6	 **1d**	 **2a**		40	91
7	 **1e**	 **2a**		40	92
8	 **1f**	 **2a**		40	92
9	 **1f**	 **2a**		45	92

[a] Reaction condition: **1a** (1 mol), **2a** (1 mol) and nano catalyst under aqueous condition at room temperature.
[b]Isolated yields

The electron withdrawing substituents gave better product yield at 4 and 2 position of the benzene ring when contrasted with 3 position. While electron donating ones at these positions gave variable product yields. This variety in productive yields with nature and position of substituents might be because of resonating , inductive and sterric impacts nano $NaSrBi_{(1-x)}Eu_xWO_6$ additionally indicated great reactant action with aliphatic aldehydes, for example, propionaldehyde. In this substrate contemplate we additionally screened unsaturated aromatic aldehydes, for example, cinnamaldehyde which gave great response to synthesize these heterocycles.

II. ACKNOWLEDGMENT

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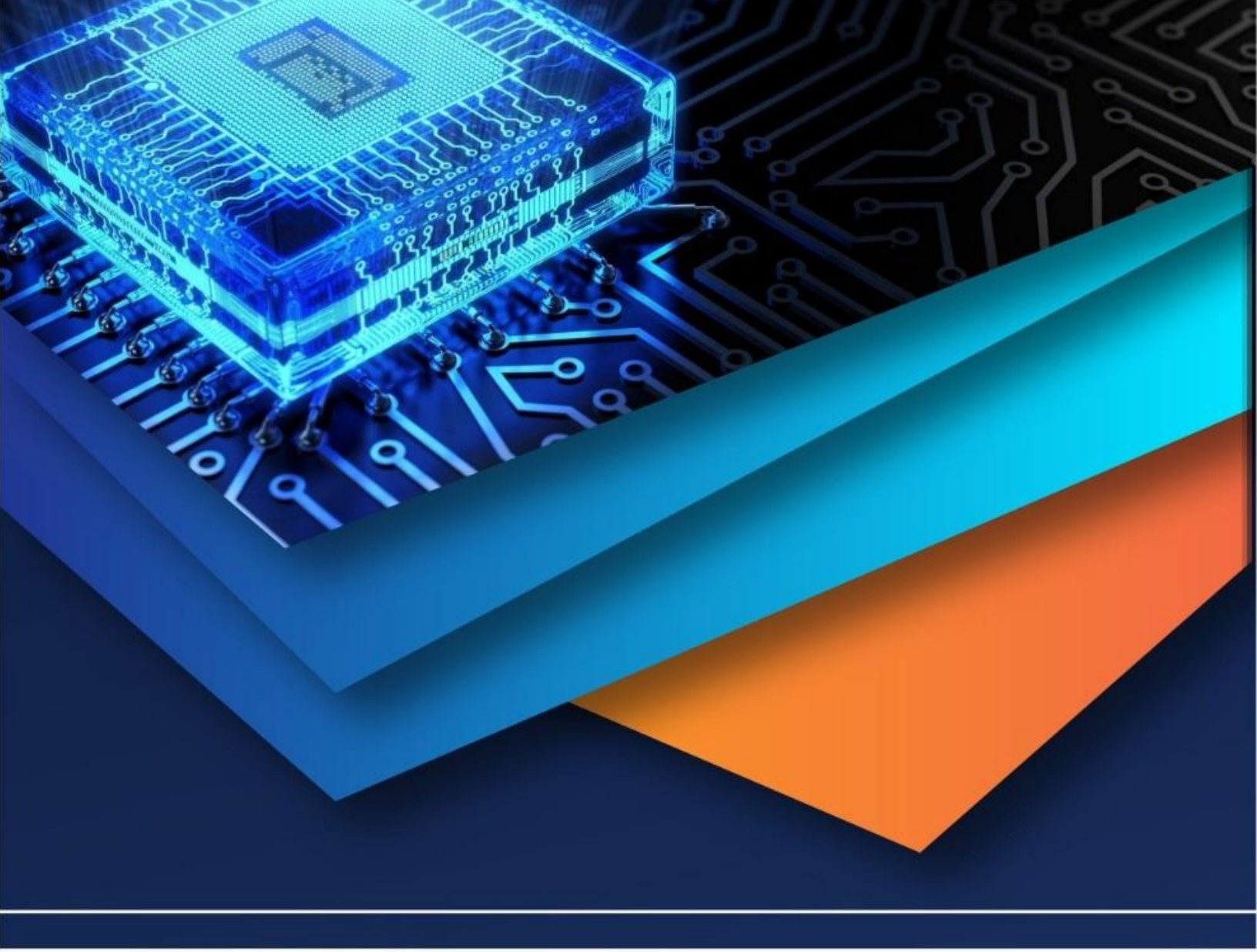

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