



OFFICE OF THE PRINCIPAL  
**S.B.DEORAH COLLEGE**  
**ULUBARI, GUWAHATI – 781 007**  
Tel.: 0361-3511878  
E-mail: sbdeorahcollege@gmail.com  
Website: www.sbdeorahcollege.org.in



The Institution has several collaborations/linkages for Faculty exchange, Student exchange, Internship, Field trip, On-the- job training, research etc. during the year

## Research Collaboration

22. Dr. Jayantha K. Nath, Assistant Professor, Department of Chemistry, S. B. Deorah College, has Research Collaboration with Dr. Dipankar Barman, Professor, Dept. of Chemistry, Indian Institute of Technology Guwahati

Published on 20 January 2023. Downloaded by INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI on 25/02/2023 7:57:37 AM.

**Organic & Biomolecular Chemistry**

ROYAL SOCIETY OF CHEMISTRY

COMMUNICATION

View Article Online  
View Journal

Check for updates

Cite this: DOI: 10.1039/d3ob00004d  
Org. Biomol. Chem., 2023, 21, 1657–1661  
Received 2nd January 2023,  
Accepted 18th January 2023  
DOI: 10.1039/d3ob00004d  
rsc.li/obc

**Heterogeneous iron catalyst for C(1)–H functionalization of 2-naphthols with primary aromatic alcohols†**

Subir Biswas,<sup>a</sup> Dipankar Barman,<sup>b</sup> Gautam Gogoi,<sup>a</sup> Nazimul Hoque,<sup>a</sup> Arpita Devi,<sup>a</sup> Siddhartha K. Purkayastha,<sup>c</sup> Ankur Kanti Guha,<sup>d</sup> Jayanta K. Nath<sup>a</sup> and Kusum K. Bania<sup>e\*</sup>

An iron oxide nanocatalyst supported on a potassium exchanged zeolite-Y (Fe<sub>2</sub>O<sub>3</sub>-KY) is an efficient and reusable catalyst that promotes the selective α-H functionalization of 2-naphthols with various aromatic primary alcohols. The reaction occurs at 110 °C in dichloroethane and requires 6 h for completion. The product yields were found to vary with respect to the nature of the substituents. Benzyl alcohols with electron-donating groups gave the highest yields of up to 90%.

Naphthols, their derivatives, and phenolic compounds are important classes of compounds because they are biologically active molecules and have applications in different pharmaceuticals and agrochemicals.<sup>1</sup> The benzylation of 2-naphthols via nucleophilic substitution with a benzyl alcohol (BA) for the synthesis of alkyl-substituted 2-naphthols is a well-studied reaction.<sup>2</sup> However, most of such Friedel-Crafts alkylation processes have been reported using secondary benzyl alcohols.<sup>2</sup> Usually, this type of C–C bond forming reaction proceeds through a carbocation intermediate. The nucleophilic substitution of secondary benzyl alcohols with a nucleophile like 2-naphthol is feasible due to the good stability of the secondary carbocation. However, the same process with primary alcohols combined with selective substitution is rather difficult as primary benzyl carbocations are less stable in comparison to the secondary ones.<sup>3</sup> Due to such factors, the nucleophilic substitution of primary alcohols has lots of disadvantages in terms of selectivity, product yield and product isolation. For such reasons, there have been few reports on the selective and direct C(1)–H functionalization of 2-naphthols with primary

BAs.<sup>4</sup> Zeng and co-workers, in their study of the C–H functionalization of phenol reported an example with 2-naphthol using a palladium (Pd) catalyst.<sup>4</sup> Similar to them, Dada *et al.* also included one example that utilizes a primary BA along with various other secondary BAs.<sup>2d</sup> Paul and co-workers synthesized 1-alkyl-2-naphthol derivatives using a Pd catalyst and a Mannich base.<sup>5</sup> The only report that provides extensive studies on the synthesis of 1-alkyl-2-naphthols is the one by Baruah *et al.* which describes a two-step process using 1-(α-aminoalkyl) 2-naphthols or phenols (Betti base) and a Hantzsch 1,4-dihydropyridine (DHP) under microwave conditions (Scheme 1a).<sup>6</sup> However, to the best of our knowledge, a process for the direct C(1)–H functionalization of 2-naphthol with BAs that utilizes a cheap metal-based heterogeneous catalyst has not been reported (Scheme 1b).

In this regard, zeolite-based catalysts are well known for their use in the heterogeneous form of the Friedel-Crafts alkylation or acylation reactions.<sup>7</sup> Due to their superiority in the transition state and their product selectivity, zeolites have also found wide application in industry for similar reactions. Apart from this, zeolites also have some other useful properties, for example, they can render both acidic and basic reaction sites,

**Experimental Work**  
(a) Alkylation of 2-naphthols and phenols

Step-1  
Step-2

(b) Direct strategy for C(1)–H functionalization of 2-naphthols with primary alcohols (This work)

**Scheme 1** Synthesis of 1-alkyl-2-naphthols.

<sup>a</sup>Department of Chemical Sciences, Tezpur University, Assam 784028, India. E-mail: kusum@tezu.ernet.in, bania.kusum@gmail.com  
<sup>b</sup>Department of Chemistry, Indian Institute of Technology Guwahati, Assam 781039, India  
<sup>c</sup>Cotton University, Panbazar, Guwahati, Assam 781001, India  
<sup>d</sup>Department of Chemistry, S.B. Deorah College, Ulubari, Guwahati, Assam, India  
† Electronic supplementary information (ESI) available: CCDC 2217708, 2217706, 2217707 and 2220406. For ESI and crystallographic data in CIF or other electronic format see DOI: <https://doi.org/10.1039/d3ob00004d>

This journal is © The Royal Society of Chemistry 2023

Org. Biomol. Chem.