Synthesis of benzo[g]indeno[2,1-b]quinoline derivatives via four-component and one-pot synthesis in presence of 3-methyl-1-sulfonic acid imidazolium hydrogen sulfate

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Abstract

A simple and facile synthesis of 12-arylbenzo[g]indeno[2,1-b]quinoline-6,11,13-trione derivatives was accomplished by the one-pot condensation of 2-hydroxynaphthalene-1,4-dione, aryl aldehydes, 2H-indene-1,3-dione, and ammonium acetate under solvent-free conditions in the presence of a Brönsted ionic liquid catalyst, namely 3-methyl-1-sulfonic acid imidazolium hydrogen sulfate.

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1. Introduction

The four-component condensation of substituted benzaldehydes with 2-hydroxynaphthalene-1,4-dione, cyclic β-diketones, and ammonium acetate has been widely used as an efficient procedure for synthesizing fused nitrogen-containing heterocycles [1–5]. Azaheterocycles with a quinoline fragment and oxo group are generating much attention, because of their pharmacological properties such as antiasthmatic, anti-inflammatory, antimalarial, anticancer, and anthelmintic actions [6–20]. In addition, these compounds are used as ligands for the preparation of organic light-emitting diode phosphorescent complexes [21–23] and they are used in the preparation of nano- and meso-structures with enhanced electronic and photonic properties [24–26]. Indenoquinoline derivatives have a wide range of biological activity such as 5-HT-receptor-binding, anti-inflammatory, antitumor, and antimalarial activity, and they also act as steroid reductase and acetylcholinesterase inhibitors [27–33]. Various methods have therefore been developed for the synthesis of substituted quinolines [34–38].

Task-specific ionic liquids (TSILs) are regarded as excellent alternatives to volatile organic solvents, and are used as environmentally benign catalysts and reagents in green synthesis, because of their negligible vapor pressures and non-flammable natures [39,40]. The use of TSIL sulfonic acids to catalyze organic reactions is an area of ongoing activity. These acids have been used as catalysts for Fischer esterification, dehydrocoupling of alcohols, and Pinacol rearrangements [41]. Furthermore, it has been suggested that water makes the proton of the sulfonic acid group more chemically available for reactions. A

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