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# Sonochemical synthesis of a new nano-sized barium coordination polymer and its application as a heterogeneous catalyst towards sono-synthesis of biodiesel

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## Abstract

A new nano-sized barium coordination polymer,  $\{(bipyH)[Ba_2(pydc)_2(Hpydc)(H_2O)_2]\}_n \cdot nH_2O$  (**1**), (bipy=4,4'-bipyridine and H<sub>2</sub>pydc=pyridine-2,6-dicarboxylic acid), has been sonochemically synthesized and fully characterized by scanning electron microscopy (SEM), X-ray powder diffraction (XRPD), FT-IR spectroscopy, thermogravimetric analysis (TGA) and elemental analyses. Compound **1** was structurally characterized by single crystal X-ray diffraction and it was shown that this compound consists of 1D anionic coordination polymers and bipyH<sup>+</sup> cationic species that construct a three-dimensional supramolecular architecture *via* non-covalent interactions *i.e.* ion-pairing and hydrogen bonding. The role of compound **1** as a heterogeneous catalyst in the production of biodiesel was also investigated. A full conversion of soybean oil to biodiesel was accomplished in an exceptionally short timeframe through an ultrasonic-assisted transesterification process in the presence of compound **1**.

**Keywords:** Nano; Barium coordination polymer; Catalyst; Biodiesel; Sonochemical process.

## 1. Introduction

Biodiesel has remarkable advantages compared to other alternative renewable fuels. Not only can it be produced from widespread bio-resources such as vegetable oils, animal fats and algal lipids, it is also nontoxic and biodegradable and has a high flash point, good lubrication properties and low gas emission without any sulfur or carcinogenic compounds during combustion [1-3].

Biodiesel is a mixture of fatty acid methyl esters obtained by the catalyzed or uncatalyzed reaction between triacylglycerols (TAGs) or free fatty acids (FFAs) and a short chain alcohol

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