

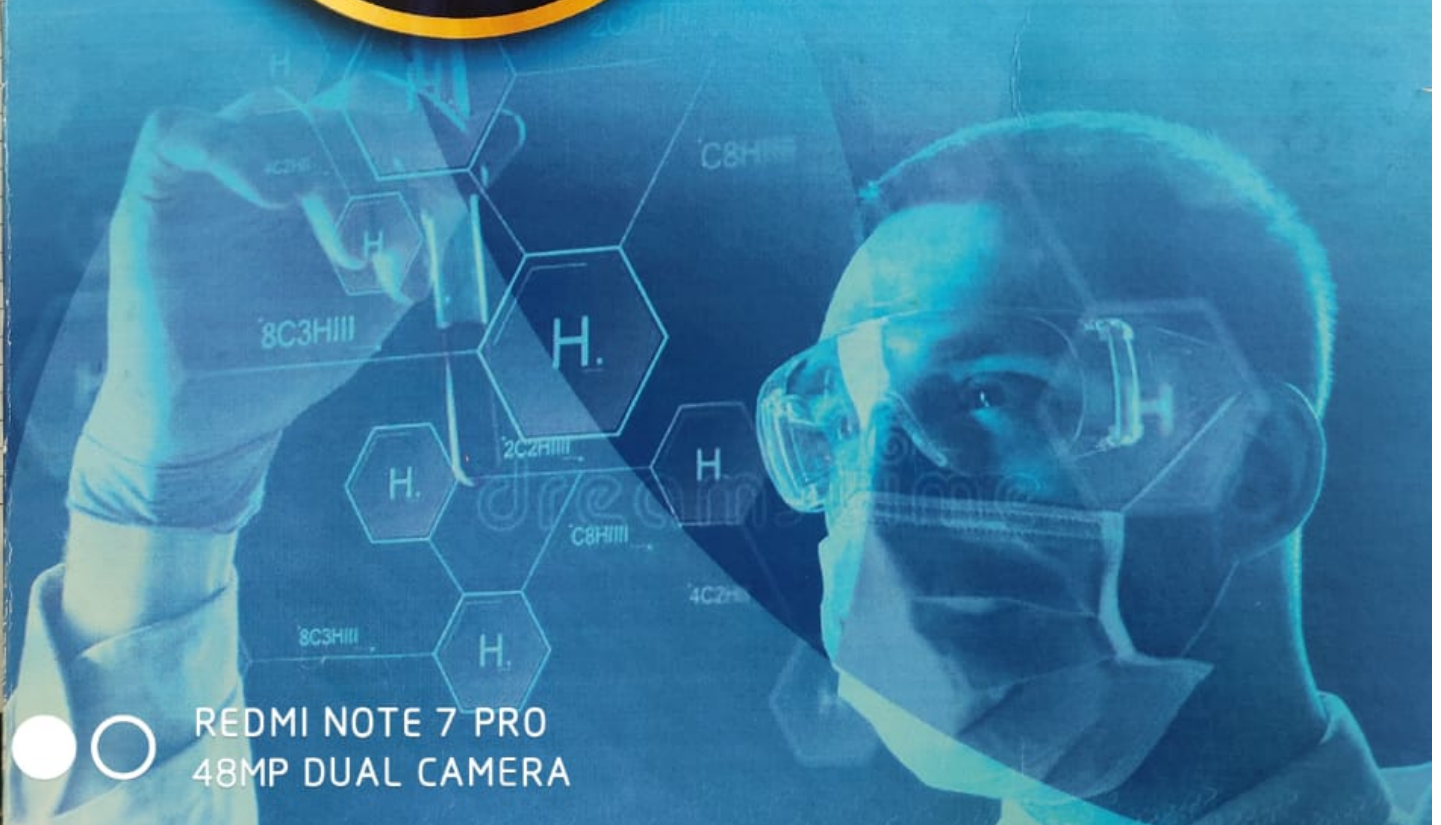


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## Fe<sub>3</sub>O<sub>4</sub> nanoparticles / Metal organic framework (MIL-53, Al) hybrid in aromatic nitrobenzene reduction

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**Abstract:** Fe<sub>3</sub>O<sub>4</sub> nanoparticles / Al-based metal organic framework MIL-53(Al) hybrid was synthesised via a room temperature sol-gel method. Initially, citrate capped Fe<sub>3</sub>O<sub>4</sub> nanoparticles of 15-20 nm in size were prepared using co-precipitation technique. In the next step, MIL-53(Al) metal organic frameworks were grown on the Fe<sub>3</sub>O<sub>4</sub> nanoparticles. The as-synthesised materials were characterised by transmission electron microscopy (TEM). The catalytic activity of the Fe<sub>3</sub>O<sub>4</sub> NPs / MIL-53(Al) hybrid towards reduction of nitrobenzene to aminobenzene have been studied. The Fe<sub>3</sub>O<sub>4</sub> NPs / MIL-53(Al) exhibits higher catalytic activity compare to pure Fe<sub>3</sub>O<sub>4</sub> nanoparticles and MIL-53(Al).

**Keyword:** (MIL stands for Materials of Institute Lavoisier).

### Introduction

Metal organic frameworks (MOFs) are the important class of porous coordination networks, formed by connecting the metal ions or metal clusters with organic linkers.<sup>1</sup> Different types of MOFs have been designed, where a group of the materials that shows the rare structural phenomenon called 'breathing'. MIL-53 (MIL stands for Material of the Institut Lavoisier) series is the very common example that belongs to that types of materials. The breathing phenomenon is initiated by external stimuli such as temperature, pressure, presence of some guest molecules in the cavity of the framework structure that can change the geometry of the framework. Structurally MIL-53 series is composed by sharing the corners of infinite trans chains of octahedral [M<sup>III</sup>O<sub>4</sub>(OH)<sub>2</sub>] (where M = trivalent metal cation) with benzene dicarboxylate linker. Different trivalent metal cations such as (Al, Cr, Fe, Ga, Sc, In) based MIL-53 have been reported, but Al based MIL-53 is advantageous over others because of its non-toxicity, cost effectiveness.<sup>4</sup> However, apart from breathing phenomenon, MIL-53(Al) acts as a very good