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## Preparation and identification of salen-Cu stabilized on the periodic mesoporous organosilica and its application as effective catalyst in the synthesis of hexahydroquinolin derivatives

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### ABSTRACT

In this study, we first developed the copper salen complex according to pre-synthesized methods, and after that, periodic mesoporous organosilicas was prepared and used as a heterogeneous substrate for the stabilization of the copper salen complex. and by various analyzes such as Fourier transform infrared spectroscopy (FTIR), thermal gravimetric analysis (TGA) and scanning electron microscopy (SEM) was identified and then, to study the catalytic activity in a one-pot and multi-component reaction, the preparation of hexahydroquinolin derivatives was investigated. as well as catalyst reuse was investigated. We observed that the catalyst was used in the 5 reaction cycles without significantly reducing catalytic activity.

**Keywords:** copper salen complex, periodic mesoporous organosilicas, hexahydroquinolin derivatives

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### 1. INTRODUCTION

Periodic mesoporous organosilicas is one of the most advanced organic and inorganic hybrid materials. In fact, this valuable hybrid nanoporous due to the presence of organic groups within its walls, in order to promote the use of hybrid mesoporous in various fields such as chemical adsorbents, chromatography, catalytic processes, chemical sensors, stabilization of active metal species, etc., were introduced. In recent years, much progress has been made in controlling the synthesis of periodic mesoporous organosilicas and because of the special uses of this material, they are known as a catalyst, in periodic mesoporous organosilicas, organic units are bonded to the siloxane bridges of the silica structure. A high degree of lipophilicity and molecular order, homogeneous distribution of organic components with maximum loading in the structure as well as adjustment of polarity, hydrophobia and lipophilicity by the use of various functional prefabricated materials in nano periodic mesoporous organosilicas, the advantages of these materials are relative to the former hybrid organosilica. periodic mesoporous organosilicas because of its ability to rapidly propagate target molecules and large molecules in the host network, it can be used as a catalyst for material storage in heterogeneous catalytic reactions, to create active centers for catalysts in selective absorption, the mesoporous of silica can be functionalized by fixing organic groups on these surfaces[1] to [4]. Schiff base are active groups that contain a double carbon-nitrogen linkage that attaches nitrogen atoms to the aryl or alkyl group, the features of these ligands are two shared covalent bonds and two dative links, all of which are found on a makeup page. These ligands have the ideal position to coordinate with the transition metal. The condensation of the two equivalent from the salicylaldehyde derivatives with 1,2-diamines leads to the formation of a very important group of Schiff base ligands in the name of the salen, the first metal salen complex was reported by Fifehr et al in 1933. Due to their structural properties, metal salen's exhibit a wide range of chemical activities and are widely used as catalysts for organic reactions. metal salen complexes are known as useful probes for biological research as well as potential therapy agents. The Schiff base complexes with intermediate metal ions are suitable catalysts for homogeneous and heterogeneous reactions. The stabilization of the metal salen complexes on the surface of the periodic mesoporous organosilicas has been very interesting due to its excellent properties, such as high catalytic activity, due to the presence of the metal center, Having capability, reusability and recaverity, high surface area, and also easy diffusion of organic substrate for typical transformations. It has been used as a catalyst in various reactions, including cross-coupling, oxidation reaction and synthesis of 1,2,3-triazoles[5] to [8]. hexahydroquinolin derivatives, which are hexahydroquinolines as a subset of 1,4 dihydropyridine. Many catalysts, including have been used to synthesize these compounds in the past such as Yb(OTf)<sub>3</sub>,