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## Metallogel Templated Synthesis and Stabilization of Silver-Particles and Its Application in Catalytic Reduction of Nitro-Arene

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### ABSTRACT

Metallogel of iron-carboxylates was obtained from *trans* 1,2 cyclohexanedicarboxylic acid in dimethylformamide (DMF) at basic condition. Spectroscopic and SEM morphology study of the iron-metallogel revealed that the iron complex with dicarboxylic acid was linked together *via* carboxylates and led to a supramolecular helical like architecture. The synthesized metallogel served as an excellent template for *in-situ* reduction of silver ion to silver particles micro to nano scale range. Variation of AgNO<sub>3</sub> concentration shepherd to change the morphology of the Ag-particles. AgNO<sub>3</sub> concentration was found to affect the shape and size of silver particles. On going from lower to higher concentration shape of silver particles changed from spherical to large agglomerated particles. Cubic shape Ag-particles were found on treatment of 0.05M AgNO<sub>3</sub> solution with metallogel. Cubical shape silver particles were found to be effective catalyst for nitro-arene reduction in presence of NaBH<sub>4</sub>. Density functional theory (DFT) calculations were performed to rationalize the role of Ag-particles in catalytic reduction of 4-nitrophenol to 4-aminophenol. Based on DFT study, we proposed that catalytic reduction occurred *via* Ag-hydride complex formation. Since metallogels as well as the 4-aminophenol are finding large application in pharamaceuticals industries therefore the current work can provide an alternatives path in production of 4-aminophenols. In addition to this, the synthesis of Ag-nanomaterials using metallogel as template can pave a new direction in the development of nanotechnology and might find wide applications in catalytic industrial processes.

**Keywords:** *trans* 1,2 cyclohexanedicarboxylic, DFT, Fe-Metallogel, Reduction of 4-nitrophenol, Silver particles

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