

Nd-LArg-5BrSalen@MNC as a practical and reusable nanocatalyst in the synthesis of tetrazoles with antifungal properties in agricultural

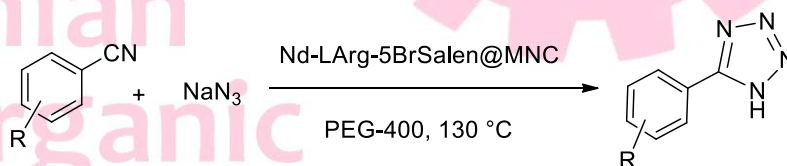
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This project reports a simple procedure for the synthesis and characterization of neodymium on MCM-41 magnetic nanoparticles (MCM-41 MNC) as a reusable nanocatalyst. Firstly, MCM-41 MNC prepared by Fe₃O₄-dopping into mesoporous MCM-41 channels. Then, a novel neodymium Schiff base complex was immobilized on MCM-41 MNC. Finally, this catalyst (Nd-LArg-5BrSalen@MNC) was used as magnetically recoverable nanocatalyst in the synthesis of tetrazoles. This nanocatalyst was characterized via TGA, TEM, SEM, FT-IR, SEM-EDS, VSM, ICP, XRD, WDX, and BET techniques. All tetrazole products were synthesized with high yield in short time and were identified by ¹H NMR, FT-IR and physical properties. Nd-LArg-5BrSalen@MNC nanocatalyst can be isolated and reused for several times consecutively without considerable loss of its catalytic activity. The recycled catalyst was characterized by SEM, EDS, WDX, XRD and FT-IR techniques. Also, the antifungal activity of the some tetrazole derivatives was studied against *Fusarium oxysporum* (rot disease of chickpea root) and *Botrytis cinerea* (gray mold of strawberry) using the paper disk method on PDA culture medium.



Scheme 1. Synthesis of tetrazoles catalyzed by Nd-LArg-5BrSalen@MNC nanocatalyst

Keywords: Mesoporous MCM-41, magnetic nanoparticles, tetrazoles, antifungal, neodymium

References

- [1] B. Tahmasbi, A. Ghorbani-Choghamarani, *New Journal of Chemistry* **2019**, 43, 14485-14501.
- [2] B. Tahmasbi, M. Nikoorazm, P. Moradi, Y. Abbasi Tyula, *RSC Advances* **2022**, 12, 34303-34317.
- [3] P. Moradi, *RSC Advances* **2022**, 12, 33459-33468.
- [4] A. Bhar, A. Jain, S. Das, *Proceedings of the Indian National Science Academy* **2021**, 87, 260-274.