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# Lacunary Keggin-type Polyoxometalate-Based Framework: Design of a Heterogeneous Catalyst for Efficient Degradation of Dye from Aqueous Solution

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In the past decades, the serious water pollution due to organic dyes and pigments affected the earth's environment, animal and human health. Catalysts based on polyoxometalates (POMs) have been extensively studied in water treatment due to their superior removal capacity in heterogeneous and homogeneous processes [1].

It is well known that lacunary derivatives are more reactive than the original Keggin anion due to the presence of multiple labile terminal oxo ligands. Lacunary POMs with a set of remarkable properties such as high coordination reactivity, rigidity, oxidative and thermal stability are an important sub-class of POMs. The lacunary species with high negative charge and nucleophilic oxygen-enriched surfaces can interact with various cations [2-4].

In this work, a new hybrid based on lacunary polyoxotungstate ($K_8[SiW_{11}O_{39}]$), Copper(II) nitrate trihydrate ($Cu(NO_3)_2{\cdot}3H_2O$) and chelidamic acid ($C_7H_5NO_5$) was synthesized. Furthermore, the synthesized hybrid showed high catalytic activity in the degradation of methylene blue (MB) as an organic pollutant, and degradation efficiency reached 93.83% within 120 min.

***Keywords:*** Polyoxometalate, Lacunary, Keggin, Catalysis, Methylene blue.

**References**

[1] Y. K. Recepoglu, A. Y. Goren, Y. Orooji, V. Vatanpour, N. Kudaibergenov, and A. Khataee, *Journal of Water Process Engineering*, **2023**, 53, 103863.
[2] M. Arab Fashapoyeh, M. Mirzaei, H. Eshtiagh-Hosseini, A. Rajagopal, M. Lechner, R. Liubc, and C. Streb, *Chemical Communications*, **2018**, 54, 10427.
[3] R. Khajavian, V. Jodaian, F. Taghipour, J. T. Mague, and M. Mirzaei, *Molecules*, **2021**, 26, 5994.
[4] M. Akbari, M. Mirzaei, and A. Amiri, *Microchemical Journal*, **2021**, 170, 106665.