

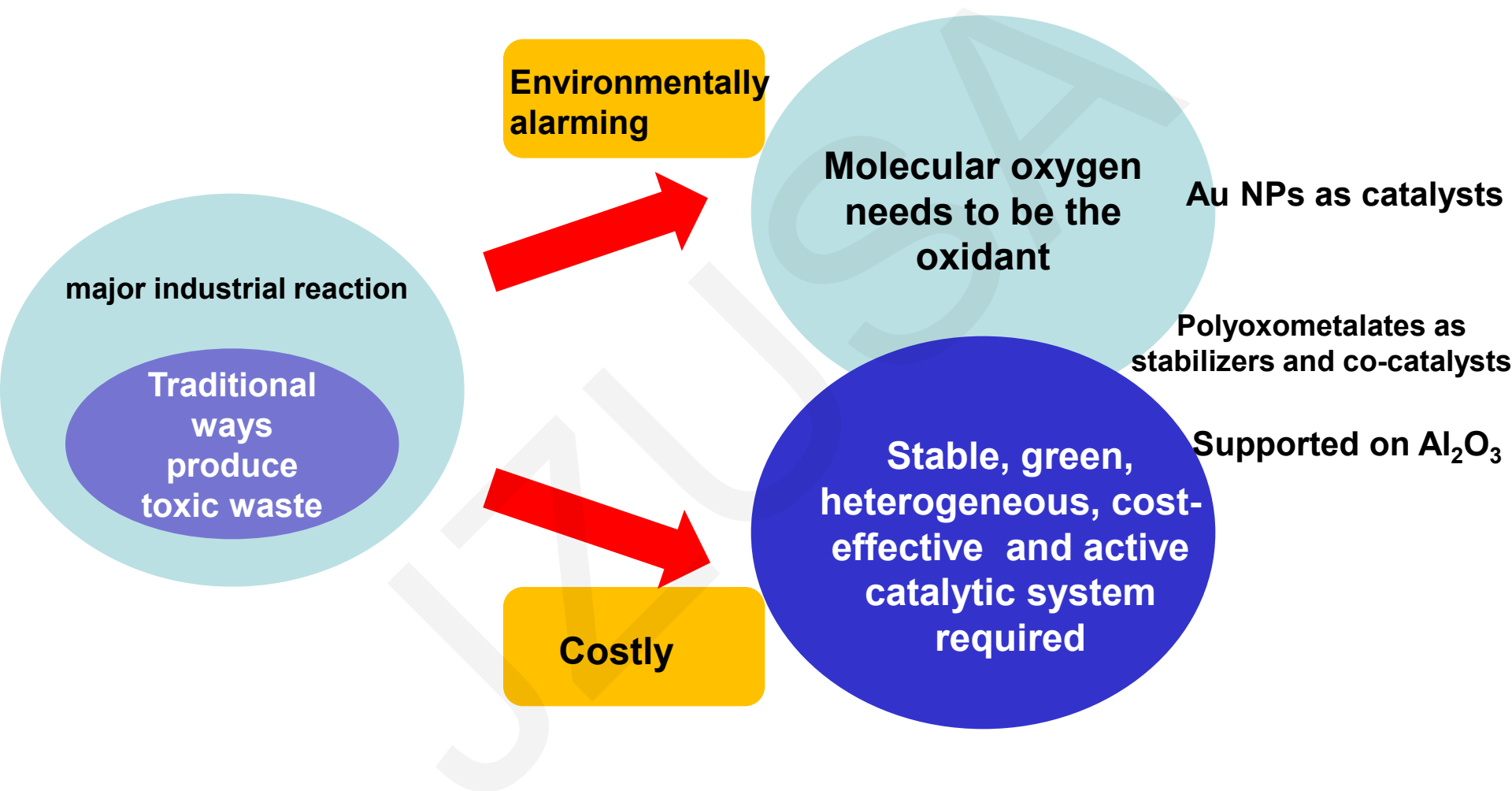
# Green epoxidation of cyclooctene with molecular oxygen over an ecofriendly heterogeneous polyoxometalate-gold catalyst $\text{Au/BW}_{11}/\text{Al}_2\text{O}_3$

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**Key-words:** Nano gold; polyoxometalate; cyclooctene; epoxidation; molecular oxygen.

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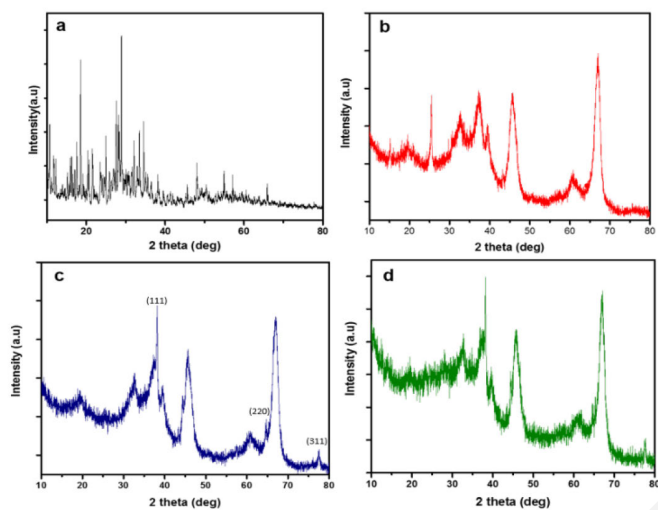
# Olefin Epoxidation



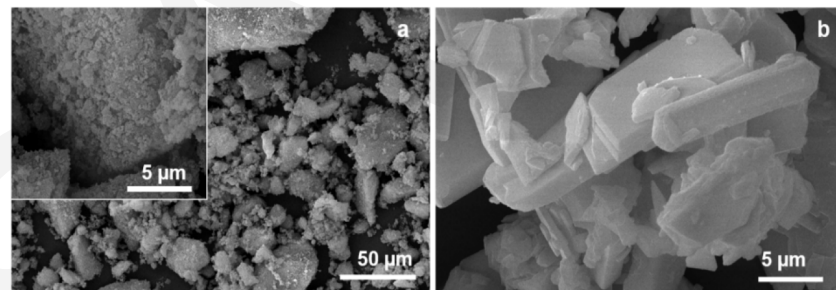
# Experimental Method

- ❖ Synthesis of Polyoxometalate  $BW_{11}$
- ❖ Synthesis of  $Au/Al_2O_3$
- ❖ Synthesis of hybrid catalyst  $Au/BW_{11}/Al_2O_3$
- ❖ Characterization of the hybrid catalytic materials
- ❖ Application for epoxidation of cyclooctene with  $O_2$  as oxidant under mild conditions

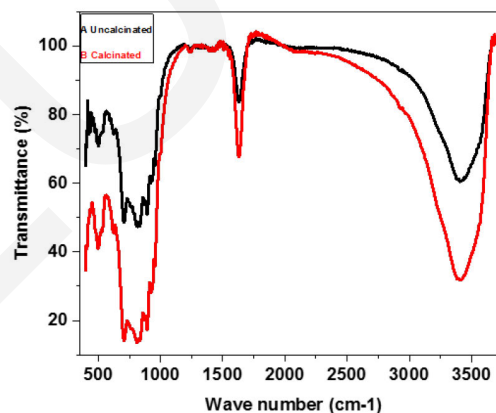
# Successful Synthesis



XRD patterns of Keggin type a)  $BW_{11}$ , b) bare  $Al_2O_3$ , c)  $Au/Al_2O_3$ , d)  $Au/BW_{11}/Al_2O_3$



SEM Images of (a)  $Au/BW_{11}/Al_2O_3$ , (b)  $BW_{11}$



FT-IR spectra of  $BW_{11}$  A) uncalcinated, B) calcinated at 500° C for 3 hours

# Results and Conclusions

- The reaction was optimized using different parameters such as the calcination temperature of the catalyst, the catalyst dosage, reaction temperatures and time, different oxidants along with a variety of solvents.
- The catalyst  $\text{Au/BW}_{11}/\text{Al}_2\text{O}_3$  performed very well for cyclooctene epoxidation giving a good conversion as high as 46% and excellent selectivity for epoxide as high as 92% under specific reaction conditions.
- The catalyst utilized molecular  $\text{O}_2$  efficiently as the oxidant and achieved good results without the use of high temperature and organic solvents.
- The catalyst was stable to heat and recyclable after successive catalytic cycles during the analysis.

# Results and Conclusions

- In conclusion, the solid catalytic system Au/BW<sub>11</sub>/Al<sub>2</sub>O<sub>3</sub> combining gold nanoparticles and the Keggin type POM over  $\gamma$ -Al<sub>2</sub>O<sub>3</sub> support for aerobic epoxidation of olefins is highly active under mild conditions without using any organic solvent.
- The superiority of the catalyst lies in an efficient activation of molecular oxygen and cyclooctene.