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"Chemo-green synthesis of ZnO nanoparticles via sol-gel method *and its application for* photocatalytic degradation of toxic methylene blue dyes"

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INTRODUCTION & AIM

Acacia arabica tree is a moderate-sized, short-trunked, and almost evergreen mostly found in drier parts of land, aqueous stem bark extract of this plant contains phenolic, condensed tannin which act as reducing and capping agent in green synthesised ZnO NPs, make it least toxic with moderate bandgap energy, semiconductor photocatalysts for treatments of wastewater containing dyes effluents.

METHOD

At the initial stage, a 40 mL aqueous leaf extract of *Acacia arabica* is combined with 460 mL of 4.36M $(CH_3COOH)_2.2H_2O$,heated at 60°C while stirring, obtained precipitate was filtered, remaining filtrate to be used for the chemo-green synthesis of ZnO nanoparticles (NPs). Now 30 mL of NH_4OH solution was added dropwise to 500 mL of the filtrate obtained from initial stage of the reaction with constant stirring for 20 minutes at room temperature and then stirred at 60°C for 4 h. The resulting chemo-green ZnO NPs are filtered, washed with ethyl alcohol, followed by calcination at 450^0C for 2.5 h, washed with ethanol then oven dried and represented as ZNO NPs F . For photocatalytic testing, a 10 mg/L aqueous solution of malachite green dyes and 1 g/L ZnO NPs was stirred, followed by irradiation in open sunlight.

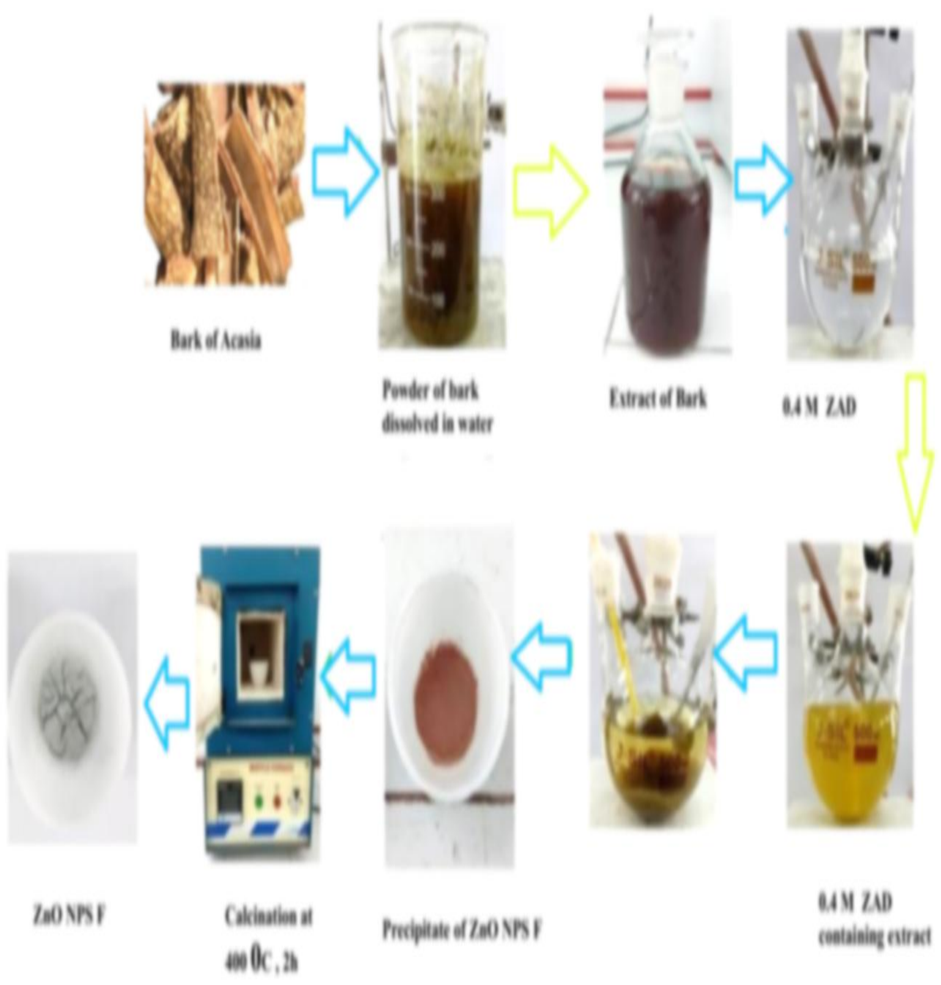

Fig.1 Schematic representation of synthesis of ZnO NPs $_F$

RESULTS & DISCUSSION

Here chemo-green synthesised ZnO NPs have direct band gap energies equivalent to ZnO NPs from the chemical and green method; negatively charged surfaces, degraded the 90% MB dyes in 100 minutes. FTIR (Fig.1) confirmed the formation of ZnO NPs. In dark degradation is negligible (Fig.2), but as suspension place in sunlight , degradation started. Fig.3 reveled the apparent rate constant is 0.02166/min , half life period 32 min.

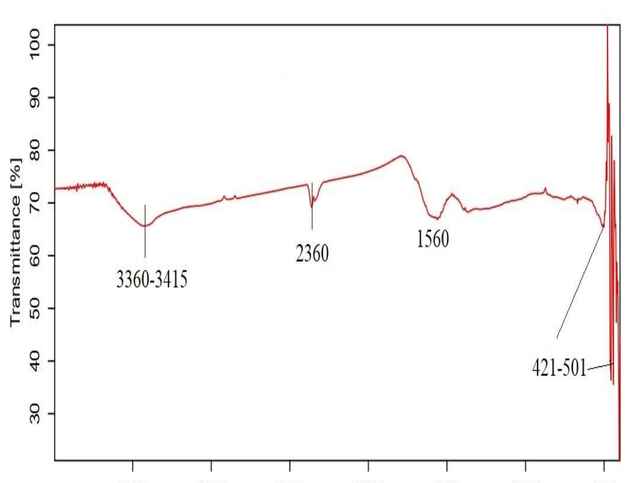

Fig.2. FTIR graph of Synthesised ZnO NPs F

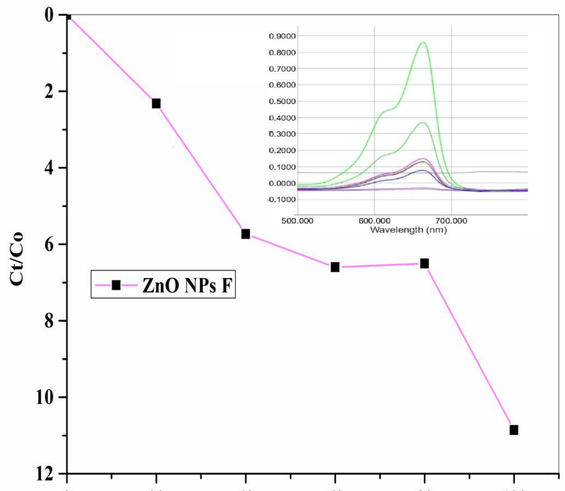

Fig.3.Absorption spectra of MB in the presence of ZnO NPs F and the extent of MB degradation

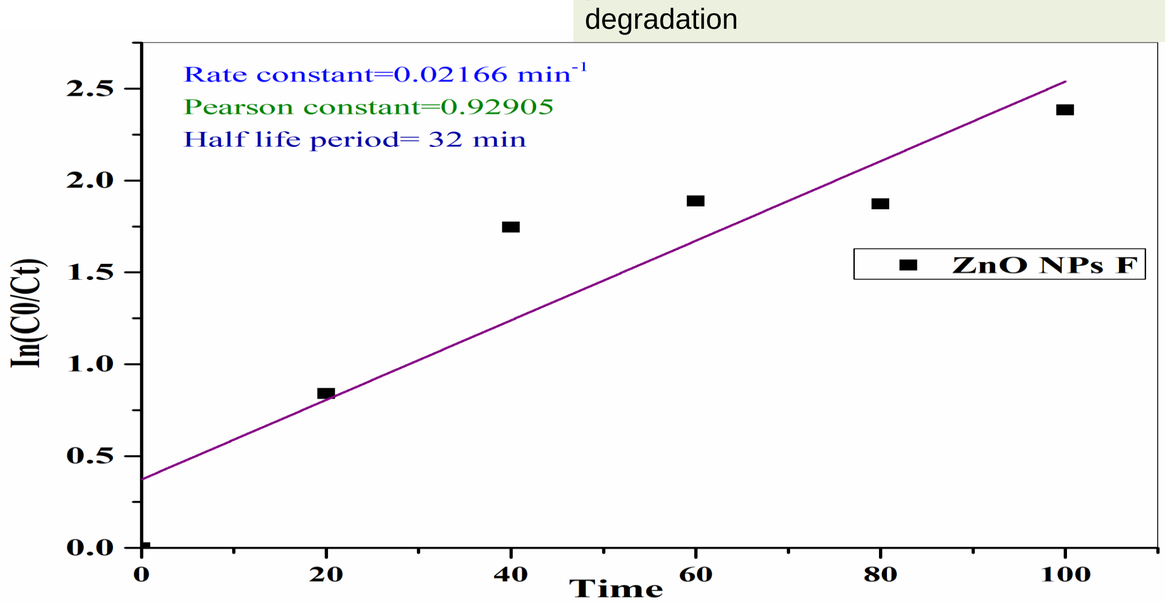

Fig.4. Kinetics studies for the photolytes activity of MB dyes

CONCLUSION

This research suggests the reutilization of unused filtrate obtained from the green method for further high-yield synthesis of ZnO NPs with scant use of NH_4OH, stimulating sustainability, lightening the economic burden,

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