# Impediment of bacterial growth and biofilms via surface engineering of Ag@ZnO

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**Introduction** Biofilms can be defined as microbial aggregates encased in extracellular polysaccharide matrix which often adhere to a surface. Some strains of *E. coli* have greater ability to adhere to and replicate in breast tissue and may lead to persistent infections in the host. The biofilm formation can be inhibited by the use of certain antibiotics and biological drugs. But the actions of antibiotics is highly inhibited by multiple drug resistant bacteria and thereby pose a public health issue. The current research is focused on the development of antibiofilm agents that are non-toxic to the immune system .

## Aim and Objective

- To synthesis Ag doped ZnO nanoparticle. .
- To tune the morphology of nanoparticle by using different capping agent structure with increasing alkyl chain.
- To characterise the synthesized nanoparticle with different techniques such as P-XRD, HR-TEM, FE-SEM etc.
- To investigate the efficacy of Ag doped ZnO nanoparticle for biofilm inhibition and preformed biofilms formed by *E. coli.*

## Experimental methods

The bimetallic nanoparticle was synthesised using sol gel method. Then the efficacy of nanoparticle was tested against the biofilms formed by *E. coli* using live and dead cell assay.

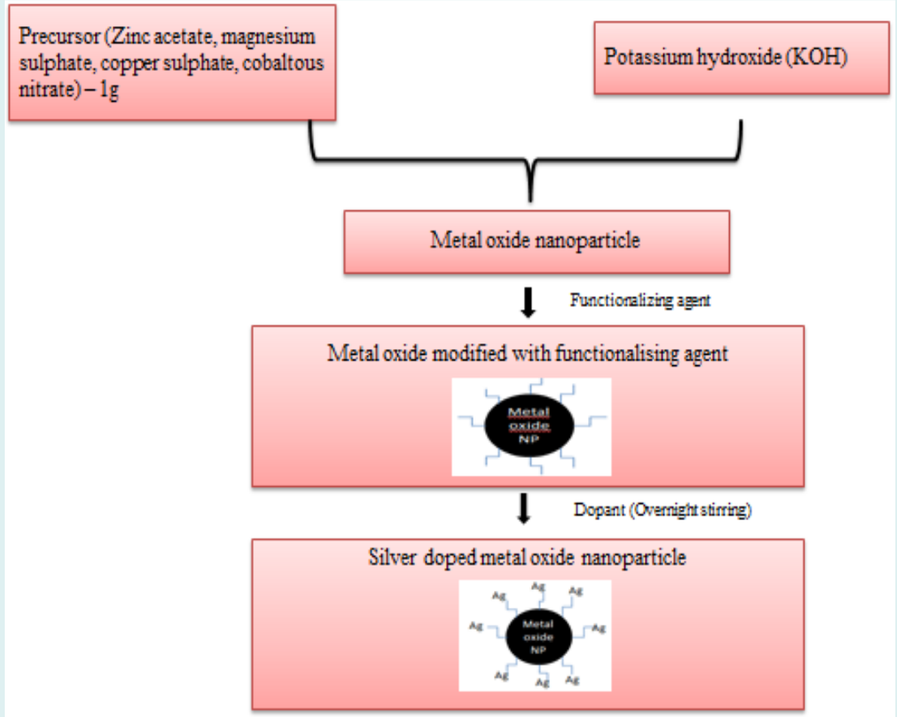



*Fig 1: Schematic representation of Nanoparticle synthesis (entire reaction was carried at 80°c)*

**Results and discussion** The treatment of preformed biofilms with Ag doped ZnO NP with different capping agent (hexylamine, heptylamine and octylamine) was studied. The result proves that the efficacy of nanoparticle against pre-formed biofilms formed by E.coli was better in Ag doped ZnO NP with hexylamine when compared to Ag doped ZnO nanoparticle with heptylamine and octylamine. From the result, it was inferred that the Ag doped ZnO NP with hexylamine acts as an efficient antibiofilm agent.

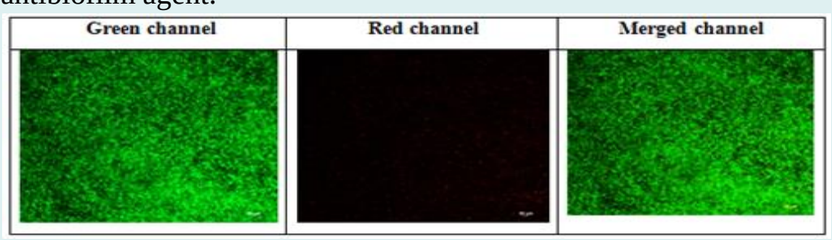



Fig 2: **:** *Fluorescence image for Preformed biofilm (untreated)*

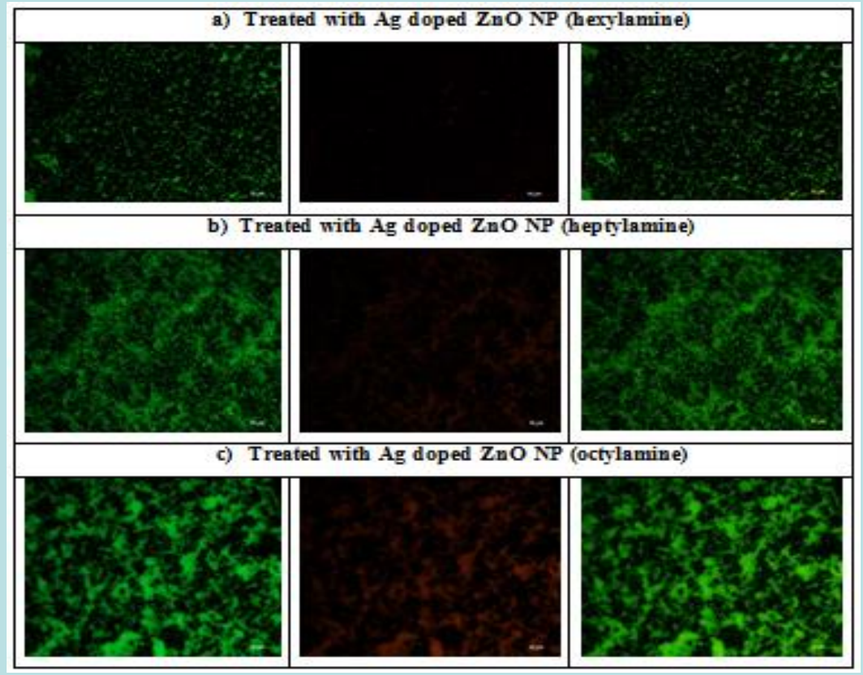



*Fig 3: Fluorescence image for 250µg/ml concentration of Ag doped ZnO NP (hexylamine, heptylamine and octylamine)*

## Conclusion

Thus the silver doped zinc oxide was successfully synthesized using a sol gel method. Then the morphology of the nanoparticle was tuned by using different capping agent (Heptylamine and octylamine) with increasing alkyl chain, The nanoparticle was characterized using P-XRD techniques and the result confirmed the presence of Ag and ZnO phase. The efficacy of these nanoparticles was tested for biofilm inhibition and pre-formed biofilms formed by E. coli and from the fluorescence image it was concluded that the Ag doped ZnO nanoparticle with hexylamine acts as an efficient antibiofilm agent.