



ARISTOTLE
UNIVERSITY
OF THESSALONIKI

RESEARCH
COMMITTEE

INORGANIC NANOPARTICLES FOR BIO-APPLICATIONS

Synthesis of metallic, bimetallic nanoparticles (NPs) and NPs of metal oxides have attracted the interest and can be used in various bio-applications. Biological activity of NPs is attributed to endogenous characteristics of metals, such as magnetic, antimicrobial properties, as well as their size and morphology. Various sizes, shapes and compositions can be achieved through control of synthetic parameters, while by appropriate post-synthetic modifications, and/or via encapsulation methods in organic matrices, can be designed hybrid functionalized inorganic/organic nanoplatforms with biocompatible characteristics.

Application Field

- Functionalized Magnetic Nanoparticles ($ZnFe_2O_4$, $MnFe_2O_4$) as drug carriers for Alzheimer and inflammation diseases. Studies of NPs in protein amyloidosis.
- Bimetallic Nanoparticles $CuFe$, $CuZn$ as antimicrobials.
- ZnO , Ca -based NPs as agrochemicals.

Services Offered to Third Parties

- Supply of NPs of different compositions and structural characteristics.
- Hydrophobic biocompatible, non-toxic nanomaterials as antimicrobials, agrochemicals and drug carriers.

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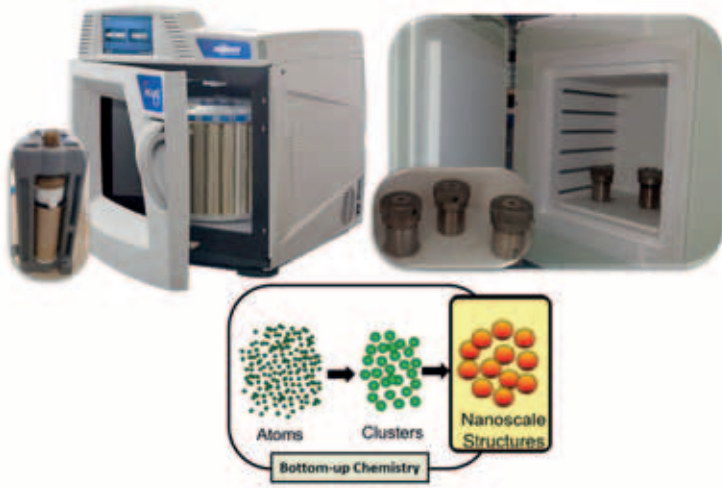


Figure 1
Hydrothermal/solvothermal/microwave assisted bottom up synthetic routes for highly stable colloidal NPs.

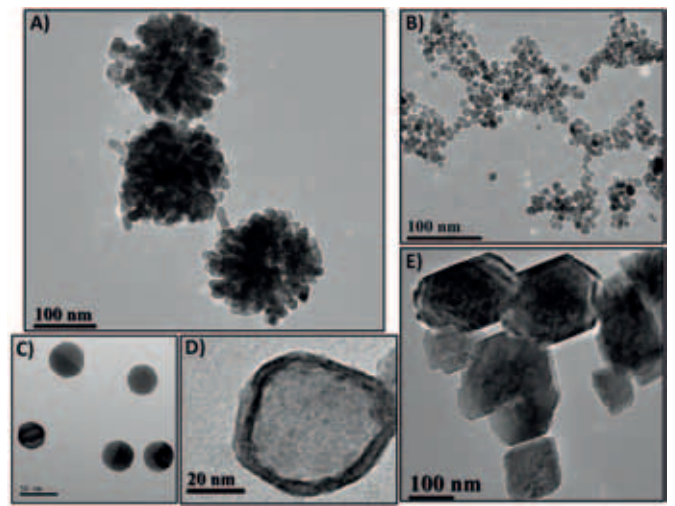


Figure 2
(A) Flower-like ZnO NPs. (B) Ultra small Zinc-doped ferrite NPs. (C) CuFe bimetallic NPs. (D) CuZn@ZnO core-shell bimetallic NPs. (E) CaCO₃ NPs.

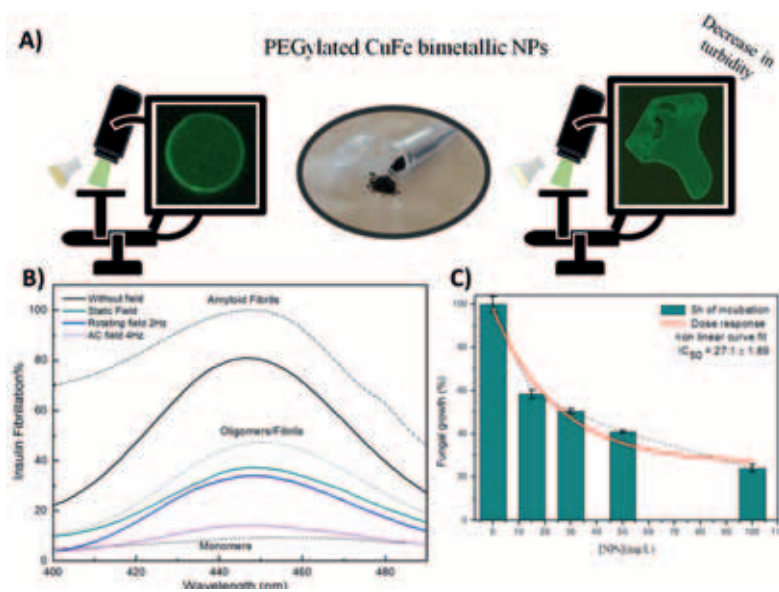


Figure 3
(A) Morphology of fungal cells after incubation with CuFe bimetallic NPs. (B) Insulin antifibrillation induced by Zinc-doped ferrite NPs in the presence/absence of various magnetic fields. (C) Antifungal activity of CuZn bimetallic NPs.

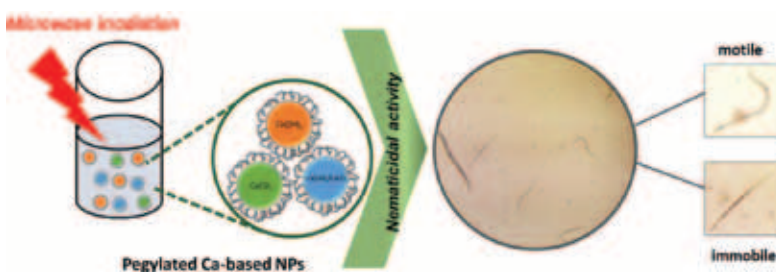


Figure 5
Optical microscope image of nematocidal (*M. incognita*) activity after treatment with Pegylated Ca-based NPs.

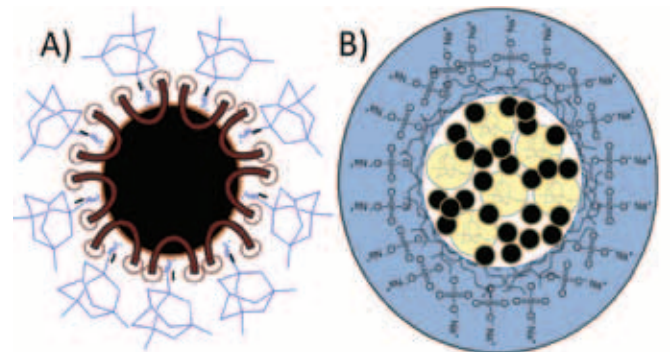


Figure 4
(A) Magnetic nanocarriers of memantine (Alzheimer's drug). (B) SDS nanoemulsions of magnetic NPs & Fluorescent modified memantine.

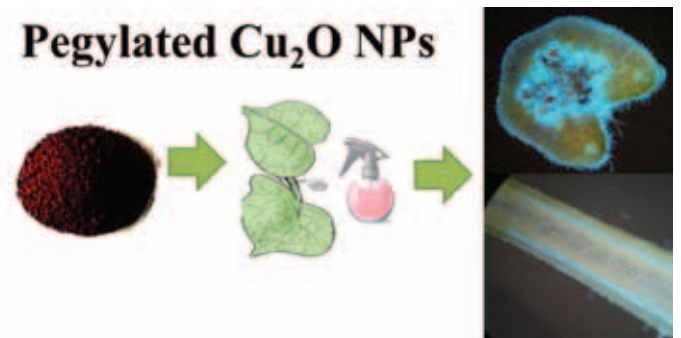


Figure 6
Confocal laser-scanning microscopy (cross and longitudinal sections) of *P. vulgaris* tissues infected by *P. syringae* strain and treated with Cu₂O@Alizarin Red S NPs.