ARISTOTLE UNIVERSITY OF THESSALONIKI
RESEARCH COMMITTEE

NANOPARTICLES OF BIOREACTIVE METALS AS ANTIMICROBIAL AND AGROCHEMICAL AGENTS

Nanoparticles (NPs) of bioreactive metal are novel materials developed as alternatives to problems associated with the abuse of current antimicrobial and agrochemical agents. Copper, Zinc and Iron based NPs are synthesized through hydrothermal, solvothermal and microwave assisted wet chemical routes. Size, shape, structure, surface chemistry as well as composition of NPs are tailored by regulating synthetic parameters. Bioreactivity is evaluated towards a variety of human & plant pathogenic microbes, via bio-assays and toxicity assessments

Application Field

- Stable NPs with optimal characteristics and enhanced antimicrobial action
- Bio-essential architectures for biocompatibility and toxicity control
- Hydrophilicity permits facile application in the agrochemical sector
- Bioreactivity through different mechanisms of action.

Services Offered to Third Parties in the following fields

- Supply of NPs of different compositions and structural characteristics
- Hydrophilic, biocompatible, non toxic and bioreactive materials

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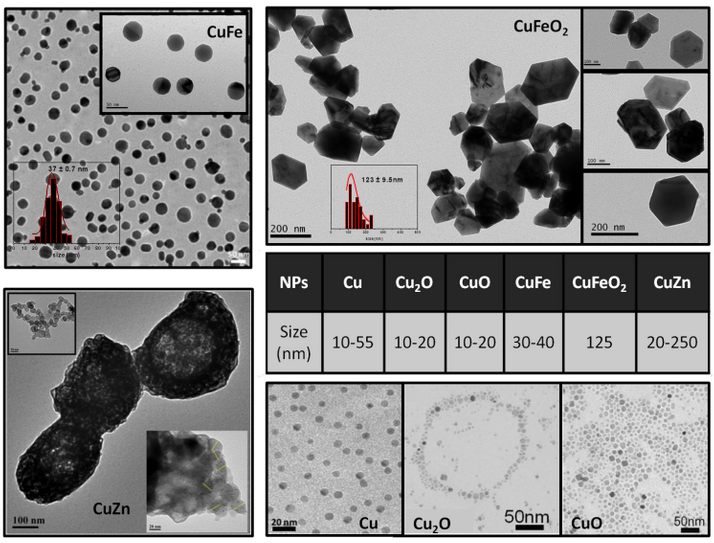
Image 1
Hydrothermal/solvothermal/microwave assisted bottom up synthetic routes for highly stable colloidal hydrophilic NPs with biocompatible organic (polyol) coating.



NPs	Cu	Cu_2O	CuO	CuFe	$CuFeO_2$	CuZn
Size (nm)	10-55	10-20	10-20	30-40	125	20-250

Image 2
Size, shape, composition of NPs.

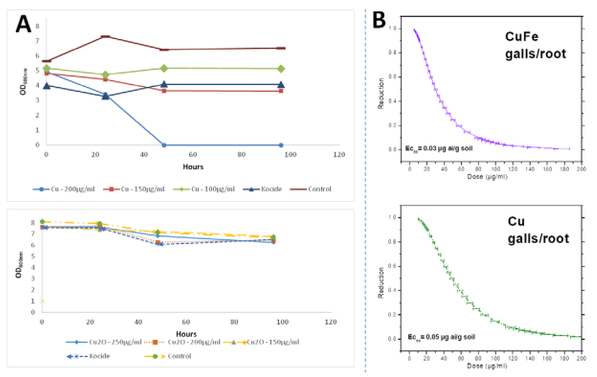


Image 3
(**A**) Antibacterial (*P. syringae B728a*) and (**B**) nematicidal (*M. incognita*) activity of Cu-based NPs in pot experiments (*P. vulgaris and Solanum lycopersicum*, respectively).

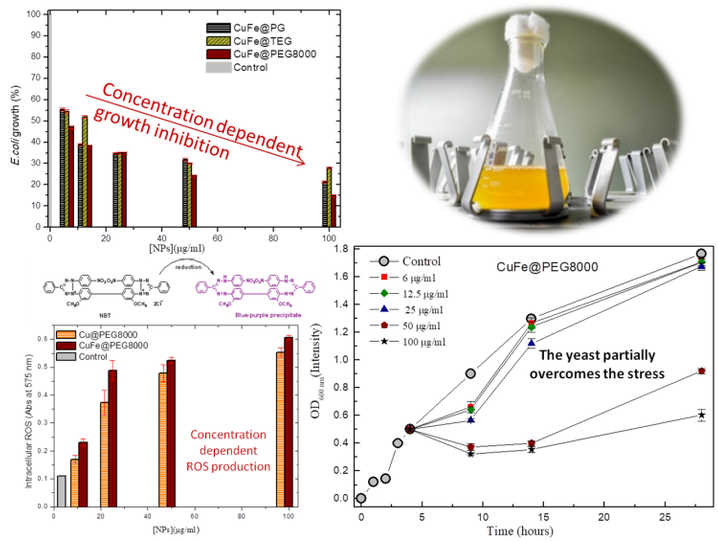


Image 4
Antimicrobial activity (*E. coli and S. cerevisiae*) and reactive oxygen species (ROS) production induced by Cu and CuFe NPs.

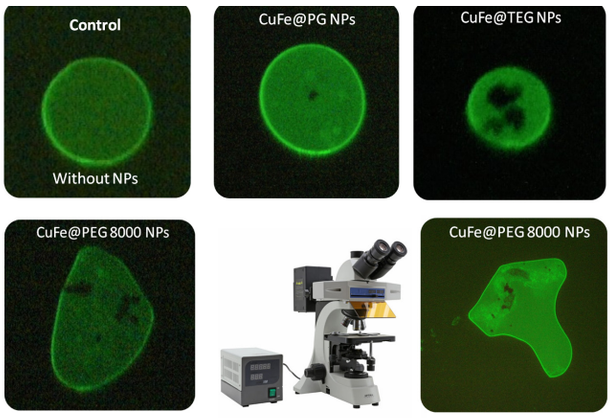


Image 5
Optical imaging of Fungal Cells (*S. cerevisiae*) by fluorescence microscopy.

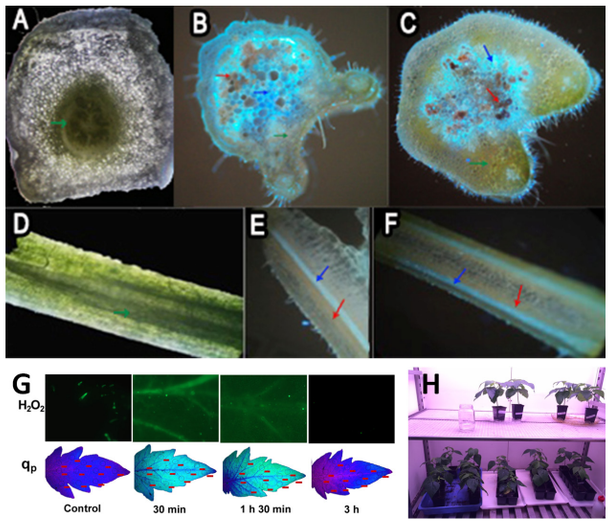


Image 6
Optical imaging (cross and longitudinal sections) of infected (*P. syringae* B728a) *P. vulgaris* tissues treated with (**B**, **E**) Cu NPs, (**C** and **F**) Cu_2O NPs and (**A, D**) untreated. (**G**) Hydrogen peroxide and photosystem II functionality in tomato leaves sprayed with CuZn NPs (**H**) *P. vulgaris* pot experiment.