

# Nanotechnology Congress & Expo

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### Nanotechnology applications in clean energy sources

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One of the great technological challenges in 21st century is the development of renewable energy technologies due to serious problems related with the production and use of energy. A new promising area of research grows rapidly which is called Nanotechnologies are considered nowadays one of the most recommended choices to solve this problem. This review aims to introduce several significant applications of nanotechnology in renewable energy systems. Papers reviewed including theoretical and experimental works related with nanotechnology applications in solar, hydrogen, wind, biomass, geothermal and tidal energies. A lot of literature are reviewed and summarized carefully in a useful table to give a panoramic overview about the role of nanotechnology in improving the various sources of renewable energies. We think that this paper can be considered as an important bridge between nanotechnology and all available kinds of renewable energies. From the other side, further researches are required to study the effect of nanotechnology to enhance the renewable energy industry especially in geothermal, wind and tidal energies, since the available papers in these fields are limited.

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### Effect of ZnO nanoparticle on plant growth promoting endophyte *Piriformospora indica*

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Nanobiotechnology has a great potential to enhance the quality of life through its wide range of applications in Agriculture including Nano-Fertilizers, Nano-pesticides, Nano-herbicides. In this direction, an investigation has been initiated to study the effect of ZnO nanostructured materials on the growth of *Piriformospora indica* (Hymenomycetes, Basidiomycota) which is a novel and new cultivable mycorrhiza. This fungus possesses multifunctional activities like plant growth promoter, biofertilizer, immune modulator, obviates biotic and abiotic stresses, bioherbicide, phytoremediator, etc. Growth promotional characteristics of *P. indica* have been studied in enormous number of plants and majority of them have shown highly significant outcomes. Effect of *P. indica* has been studied on more than 150 plants indicating that a very small amount of propagule is sufficient to promote root as well as shoot growth. Promising outputs of laboratory experiments and field trials indicated the need for its biomass cultivation and usage. In the present "nano-agriculture" study, *P. indica* is treated with ZnO nanoparticles. In particular, observations were made, colonies were found to be more distinct, larger in size, more smooth and round in ZnO nanoparticles infused medium as compared to control without nanoparticle where fungal surface is rough and overall size of the colonies were not very large. The results of the study were examined by fresh and dry weight, Biomass, spore count and scanning electron microscopy analysis. It is inferred that addition of ZnO nanoparticle resulted in promising enhancement in the biomass of *P. indica*. Treatment of Broccoli seeds with nanoembedded fungal propagule resulted in early germination as compared to untreated control. The mechanisms of these two properties are under investigation.

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