96

Comparison of the Antibacterial Effect of TiO_2 and Ag Nanoparticles Prepared by Laser Ablation and Sol-Gel on Burn Related Bacteria

Zahra Eivazi Zadeh [1], Atefeh Solouk [1], Asma Motamedi [2]

[1]Faculty of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran [2]Photonic and Quantum Technologies Research School, Nuclear Science and Technology Research Institute, Tehran, Iran

QR code

2020 NMIN events Vancouver Nanomedicine

contact information:
Z.Eivazizadeh@aut.ac.ir

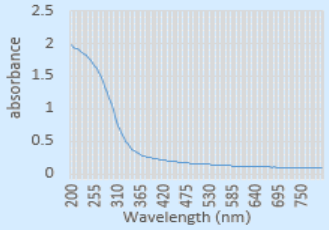
PURPOSE

Overuse of antibiotics in burn wound infections caused drug resistance. The use of antibacterial nanoparticles (NPs) is the newest and most promising method in burn infection control. Antibacterial NPs not only increase the efficiency of antibiotics, in some species affects the intracellular activity of pathogens and can control infection by this mechanism without any side effect.

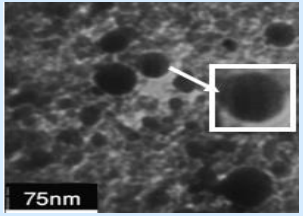
Considering the potential of metal and ceramic NPs such as Ag and TiO_2 NPs, respectively, in burn infection control, the aim of this study is comparison the antibacterial properties of laser ablated Ag and TiO_2 NPs and TiO_2 NPs prepared by sol gel.

RESULTS

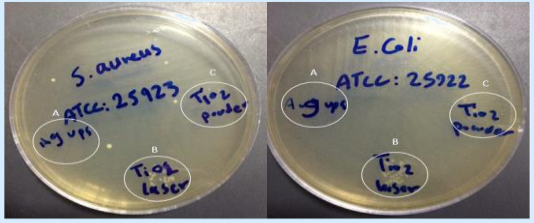
- absorbance maxima at 240 nm corresponding to TiO2 Plasmon bands, indicated TiO_2 particles in the colloid.



- The TEM image showed spherical-shaped TiO_2 NPs with a diameter of 20-30 nm are formed.



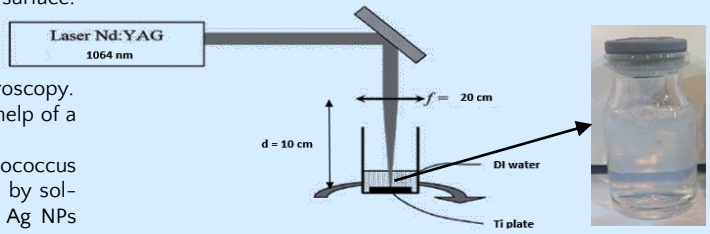
- laser-ablated TiO2 NPs could not inhibit the growth of E.coli and Staphylococcus aureus, while the others greatly inhibit the growth of these bacteria colony.



A: Ag NPs prepared by Laser ablation B: TiO_2 NPs prepared by laser ablation C: TiO_2 NPs prepared by sol-gel

METHODS

- the Ti plate in DI water is irradiated with a pulsed Nd:YAG laser for a period of time. As a result, finely dispersed TiO_2 NPs form a stable colloid, which is free from chemical reagents or ions associated with their surface.



- Formation of colloids was monitored by UV-Vis absorption spectroscopy.
- The morphology and size of nanoparticles was studied with the help of a 200 keV (CM200 FEG Philips) transmission electron microscope.
- The antibacterial properties of laser ablated TiO_2 NPs , on Staphylococcus aureus and E.coli, was compared with rutile-TiO_2 NPs prepared by sol-gel purchased from Nano Pars Lima Co. Ltd Tehran, Iran, and Ag NPs prepared by laser ablation with the same diameter, by antibiogram test.

CONCLUSIONS

To conclude, although laser ablation is a simple method to prepare a homogeneous solution of NPs with small diameter and the absence of chemical reagents or ions in the final product, because of the fast preparation in the case of TiO_2, its crystalline structure is not good enough for antibacterial applications since antibacterial activity of TiO_2 is a photocatalytic procedure that only acts in their rutile structure.