Workshop on soft X-Rays at Istanbul University in 8-9 September 2022

synthesis of nanoparticles materials and characterized by X-**Rays techniques for different applications** 



Proposal by **Mai Fouad Elshahawy Assiatant lecturer Eygptian Atomic Energy Authority** 

### Abstract

My research interest lies in the field of design and development of nanocomposite materials for biomedical and environmental

**Pervious works** 

**1- Photocatalysis process** 

we prepared the graphene oxide (GO), and graphene oxide





applications. In previous studies, I prepared different nanoparticles and applicable as photocatalyst for remediation of water, as antimicrobial for drug devilry system, and for bone scaffold. For future work, we are working on preparation nanoparticles for development the polymeric materials to be used in different application such as conductive materials, hydrogen production, wound and hemostasis dressing and scaffold.

doped titanium oxide (GO/TiO<sub>2</sub>). The prepared nanoparticles were incorporated in polymeric matrices to be used as, photocatalyst for water treatment.

The GO was prepared by modified hammer method well characterized and then doped by  $TiO_2$  as well as investigated. The GO doped TiO<sub>2</sub> was cooperated in polymer matrix and used as photocatalyst for dye solution degradation.

# **2-Antimicrobial** mucoadhesive delivery

we prepared the Zinc oxide (ZnO), sliver  $(Ag^0)$  nanoparticles by in-situ in polymers matrix and well characterized to be used as Antimicrobial mucoadhesive drug delivery as well as increasing the drug



### **3- Bone regeneration scaffold**

Mg-doped HAp nanoparticles were synthesized using wet chemical method. XRD studies verified the nanoscale size of the prepared HAp. In addition to Ca and P in the prepared n-HAp, the EDX analysis revealed the presence of Mg in the doped HAp samples. FTIR studies confirmed the existence of the characteristic functional groups of the scaffold constituents. the Mg-doped HAp nanoparticles mixed with polymers

solution to produced the bone scaffold hydrogel. The incorporation of the Mg-doped HAp nanoparticles encourages the development of bone-like apatite layer.



#### release in buccal cavity.





**Future works 2- Conductive** polymers Nowadays, we are working on the preparation of conductive polymers by doping the ZnO nanoparticles to used in biosensor. Also we are preparing the conductive ink using the CuO doped GO



## **Future works** 3- hemostasis & wound dressing

we are working on the preparation of antimicrobials nanoparticles such as ZnO, MgO, as well as nanoparticles has ability to stop bleeding such as SiO<sub>2</sub> for wound healing and hemostatic dressing respectively.



**Experimental plan** 

### **Results expected & impact**

- The preparation of nanoparticles materials and
- characterization by FTIR, XRD for crystal structure, UV visible spectroscopy, and XAFS.
- The different nanoparticles materials will investigate by XAFS spectra: (XANES) 3. and (EXAFS). XANES is used for observing the oxidation states and electron density of the elements.
- EXAFS is a technique for determining an atomic environment including 4. coordination number, type of ligand and distance of neighboring atoms.
- The XRF will be used to confirm the doping metals in nanoparticles 5.
- This prepared nanomaterials are cooperated in hydrogels matrix to be applicable in 6. industrial and biomedicals applications

- The perovskite ZnTiO<sub>3</sub> (ZTO) doped with Cotrapped in hydrogel will be investigated, clarified and evaluated as photocatalyst for hydrogen production. The photocatalytic effenciny of perovskite ZTO nanocomposites hydrogel will be increased after doped different metals ions.
- the ZnO nanopraticeles prepared on polymer subtrae used as biosensor and CuO doped in rGO mixed with polymeric materials used as conductive ink
- The ZnO and MgO prevent infection in wound which result fasting the wound 3. healing, and the  $SiO_2$  stope bleeding rapidly.