Abstract

The urgent need which imposed by imposed by the new world realities on human that leads him to reflection and research in all the scientific and material possibilities available which has it, in order to reach the common target of developing materials and methods for service of humanity especially people's health.

The thesis aimed to "biomaterial development" by biomaterials surface modification depending on coating by **hydroxyapatite** doped and undoped silver on the surfaces of famous implant medical alloys like **Ti6Al4V** alloy and **Co-Cr-Mo** alloy, after a required surface treatment consists of creating the roughness using a blasting process which depends on different sizes of alumina particles (**19, 45, 110, 250 µm**) .sol-gel technique was used as a liquid phase to precipitate the multiple layers of thin nanofilms with hydroxyapatite doped and undoped silver on rough surfaces of medical alloys to obtain thin films adhered to surface, then the morphology of surface was studied before and after of hydroxyapatite doped and undoped silver coating by using the **Scanning Electron Microscope** SEM in order to evaluate the shape and distribution of particles, as well as the study of atomic and crystalline structures showed by **X-ray diffraction** XRD.

Bioactivity and biocompatibility can be seen as important properties for medical alloys, In any case, in order to indicate their response in environments which they operate in them. Technique of **simulating body fluid SBF** have been used by immersion the samples of alloys in solution similar to human blood plasma in terms of ionic concentration for **7, 14 and 21 days**, after that, the differences of phases formed, their distribution and structures can be observed by X-ray diffraction and scan electronic microscope for both of hydroxyapatite doped and undoped silver coating with different roughness obtained as mentioned above.

On the other hand, the interface of tissue and biomaterial is an appropriate environment for bacterial colonization. Therefore, the technique of incorporating **silver** nanoparticles into hydroxyapatite was used to increase the coating effectivity against bacteria by precipitation of silver ion coatings of ion exchange, then the biofilm activity evaluated by using **P.seudomonas aeruginosa**, then study the effect of it on biomaterial before and after coating and the role of roughness through changing of surface topography on the growth of microorganisms ,as well as, evaluation of cellular compatibility or cell survival by using **MTT** method for its effect on biofilm production.

The results showed the important of roughness to enhance the hydroxyapatite doped and undoped silver coating on medical alloy surfaces of Ti6Al4V alloy and Co-Cr-Mo alloy, by another side to support the implant as an important antimicrobial agent, as well as enhancing the adhesion and bonding between surface of cobalt-chromium-molybdenum alloy and hydroxyapatite doped and undoped silver coating, which it was a barrier due to the dissolution and the breakdown of the hydroxyapatite layer. In same time, the crystalline structures having a positive effect in increasing the effectivity of the hydroxyapatite doped and undoped silver coating.

High roughness of Ti6Al4V alloy coated by hydroxyapatite which contain of bioactive apatite structure characterized of bone repair or implantation transplants that
is what apatite owned of high stability in terms of biocompatibility and bioactivity as result of uniform and homogeneous distribution of deposited layers, in addition to their positive influence in bacterial resistance and biofilms formation at Pseudomonas aeruginosa.

The importance of silver incorporated with hydroxyapatite, where silver released as ions which enhance the role of biofilms against the microbial attack, it is understood that the interfaces between the hydroxyapatite and the biomaterial more susceptible to microbial attack.in addition to, the activity of antibacterial increased with increased the roughness of surface where the surface area increases and becomes less solubility, which will be as better contact with microorganisms.

The calcium phosphate compounds formed at high roughness of cobalt- chromium-molybdenum alloy surfaces, which plays significant part in the stability of composition, bonding with biomaterial, compatibility and high bioactivity.
The results of the comparison between the Ti6Al4V and the Co-Cr-Mo of high roughness showed the formation of "**HAp** $Ca_5(PO_4)_3(OH)$ and $Ca_3(PO_4)_2$ **TCP"** sequentially, despite their role in biocompatibility, but the **HAp** characterized to be less Solubility and less bone absorption, while TCP has more soluble and non-bone used to bone repair which disappears by resorption gradually.