

## Magnesium substituted hydroxyapatite / carbon nanotubes modified surfactant nano-biocomposites: mechanical and biological properties

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### ABSTRACT

Bone substitute biomaterials, have revealed great potential for bone tissue engineering application. Therefore, there is a real need to develop new bioactive materials with good mechanical and biological properties, reacting to the increase of bio implants surgery demands. In the present work, we report the bioactivity and mechanical properties of HA-Mg/MWNTs nanocomposites with divers amount of modified surfactant-nanotubes types. Magnesium was incorporated to hydroxyapatite ceramics have an important biomedical applications as hard tissue replacements. However, its poor flexural strength compared with bone make it inappropriate for major load bearing devices. To improve the mechanical properties of HA ceramics, multiwalled carbon nanotubes are introduced into HA-Mg matrix materials. Carbon nanotubes with their high aspect ratio and excellent mechanical properties, have the potential to strengthen hydroxyapatite without offsetting its bioactivity, thus it has been a significant challenge to the application of HA for the replacement of load-bearing bone defects applications. SDS and Span-60 were used as surfactant to non-covalently functionalize MWNTs, to enhance dispersion quality and to overcome the problem of agglomeration once mixed with the ceramic matrix (Figure 1). A uniform distribution of MWNTs and good interfacial bonding help to improve the flexural strength by 20% for Mg<sub>0.6</sub>-HA/3% O-MWNTs, 44% for Mg<sub>0.6</sub>-HA/3% span60-MWNTs, and 57% for Mg<sub>0.6</sub>-HA/3% SDS-MWNTs compared to HA-Mg<sub>0.6</sub>. Mg-HA/3% SDS-MWNTs showed a dense deposited new apatite phase after only 7 days of immersion in SBF medium. Both the biological behavior and flexural strength of HA-Mg/ MWNTs nanocomposites show close relativity with MWNTs content.

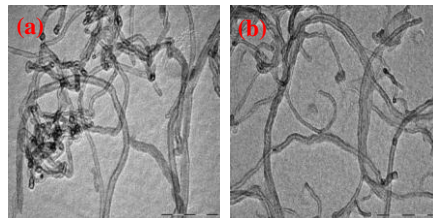


Figure 1: TEM micrographs of MWNTs / SDS (a: x 100 kx), MWNTs / Span-60 (b: x 100kx).

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