J Material Sci Eng 2018, Volume 7
DOI: 10.4172/2169-0022-C11-123



## A thorough study on a novel class II inorganic-organic multifunctional hybrid system based on poly (amido amine) and silica bioactive glass

**Parvin Alizadeh** and **Fakhraddin Akbari Dourbash**
Tarbiat Modares University, Iran

Bioactive, photoluminescent and antibacterial inorganic-organic hybrid materials combine two different and yet complimentary scientific disciplines in one system and are gaining significant interest in tissue engineering. Understanding the synthesis-structure-properties relationship of these hybrids is fundamentally important for developing new generation of highly performing systems with enhanced physicochemical properties. To this end, we developed a novel multifunctional inorganic-orgnic hybrid system between poly (amido amine) generation 5 and bioactive glass through direct hybridization by 3-glycidoxypropyltrimethoxysilane (GPTMS) as coupling agent. Hybrids were first synthesized with two different solvents ((dimethylformamide (DMF) and dimethylsulfoxide (DMSO)) and two distinct synthesis procedures (freeze drying or heat treatment). Thereafter, the effect of the degree of covalent coupling and the weight percent of different constituents was evaluated. Thorough investigations by means of FESEM, FTIR, NMR and TEM analyses proved covalent coupling and nanoscale interactions between co-networks of inorganic and organic chains. Furthermore, thermal gravimetric analysis (TGA) and Differential scanning calorimetry (DSC) studies exhibited an improved thermal stability. Moreover, hybrids exhibited photoluminescent ability (emission 400–600 nm and 700 nm) without incorporating of any organic dyes or quantum dots. High inherent antibacterial properties against *Staphylococcus aureus* was also observed. The biological apatite was formed on the surface of calcium containing hybrids when soaked in simulated body fluid (SBF) for one week and a steady degradation for inorganic phase was demonstrated by ICP-OES. No adverse cytotoxicity for human gingival fibroblast cell lines (HGF) was detected after four days by MTT analysis. These multifunctional properties make the very hybrid system highly promising for tissue engineering.

p-alizadeh@modares.ac.ir