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## **Innovative substituted hydroxylapatites and collagen scaffolds for enhanced adhesion, growth and proliferation of human osteoblasts *in vitro***

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**I**nnovative nanosized hydroxyapatite: HAP, modified HAP with Si, Mg and Zn: HAP-Si-Mg-Zn and functional scaffolds of these materials with collagen. COL represents the first report on the effects of Si, Mg and Zn, simultaneously present within the layered ceramic scaffolds in human osteoblasts culture. The 14 scaffolds were manufactured by self-assembling layer by layer technique and fully characterized by XRD, FTIR, FT-Raman, TEM, SEM and AFM. Scaffolds were tested in cell culture for adhesion and bioactivity of osteoblasts, which were cultivated for different times on scaffolds. For this goal, the cellular expression of osteoblasts markers like collagen, osteopontin and osteocalcin were visualized by fluorescence microscopy and by using immuno-cytochemical staining methods. The data indicate that the combined scaffolds made of nano HAP/COL, nano HAP-Si/COL and nano HAP-Si-Mg-Zn/COL layers have an improved stimulating activity to osteoblasts compared with native scaffolds (e.g., made only from nano HAPs), particularly in promoting the formation of mineralized bone matrix. Moreover nano HAP-Si-Mg-Zn/COL combined layered scaffolds substantially enhanced osteoblasts activity and adhesion, as evidenced by cell expression of collagen, osteopontin and osteocalcin as well as of F-actin stress fibers, *in vitro*. Thus, the current study clearly demonstrated that the incorporation of Si, Mg and Zn within HAP could be an active, safe and inexpensive tool for new HAPs development with potential clinical applications in orthopedic surgery, bone cancer therapy and nanomedicine.

### **Biography**

Maria Tomoaia-Cotisel has completed her PhD from Babes-Bolyai University (BBU) and Postdoctoral studies from London University, King's College, UK. She was the Visiting Scientist at Philipps University of Marburg, Germany, State University of New York at Buffalo, US, National Institutes of Health and Molecular/Structural Biotech., Inc., Bethesda, MD, US. She is the Director of Physical Chemistry Center at BBU. She has published over 240 original research papers, 5 patents and 10 books in physical chemistry, including thermodynamics, chemical structure, biophysics, bionanomaterials, colloids and interfaces. She has also received Gheorghe Spacu (Academy of Sciences, Romania), Alexandervon Humboldt, Germany, Promotion of Science and Technology (Japan Society) and Fogarty Award, US.

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