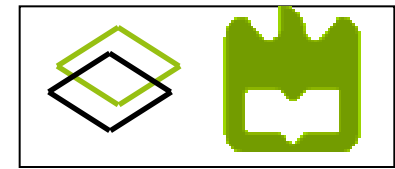
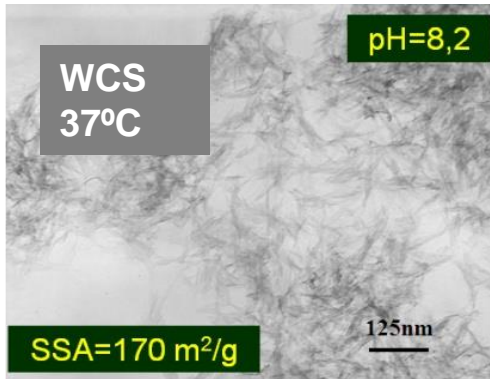


- **Complete denomination:** Department of Materials and Ceramic Engineering (DEMaC) / Centre for Research in Ceramics and Composite Materials (CICECO) – University of Aveiro
- **Location (city, country):** Aveiro, Portugal
- **Director:** Prof. Mário Ferreira (DEMaC) / Prof. João Rocha (CICECO)
- **Contact person in NEWGEN:** Prof. Margarida Almeida
- **Working Group involvement:** WG1 and WG3
- **Staff:** 4 Full Professors; 8 Associate Professors; 5 Auxiliar Professors
- **Research topics:** Nano and Micro-Structured Materials for information and Communication Technology; Materials for Energy and Industrial Applications; Sustainability and Biomaterials;
- **Researchers expertises:** Materials Science Engineering

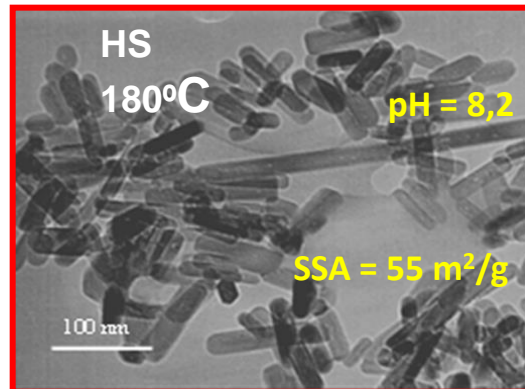


## Calcium phosphate nanostructured materials for biomedical applications

### 1. Synthesis of hydroxyapatite nanoparticles (HAP NP)



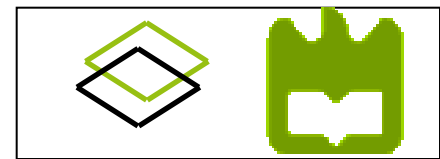
Chemical precipitation  
at 37°C



Hydrothermal synthesis  
at 180°C



Autoclaves for HAP NP  
synthesis



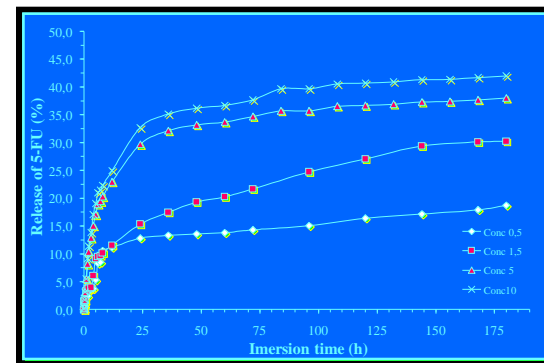
## 2. Drug Delivery Systems (DDS) based on HAP nanoparticles



Spray dryer

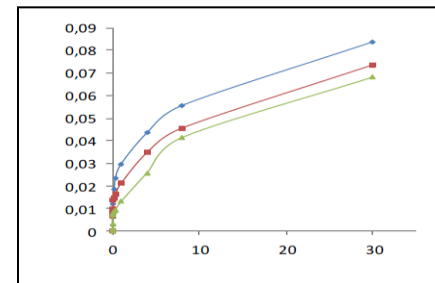
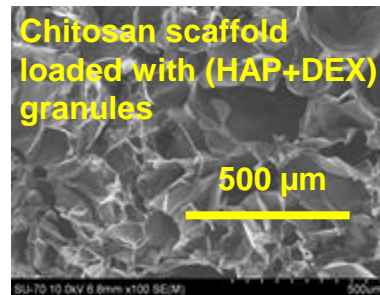
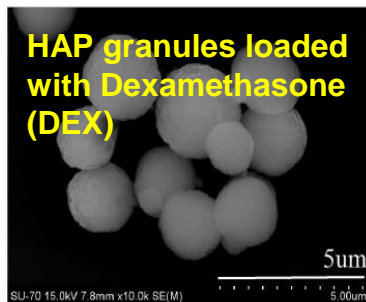


Spray dried HAP NP

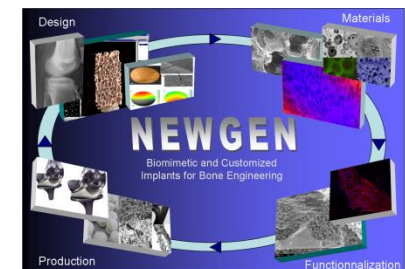


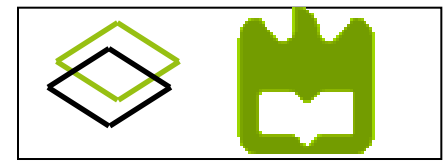
5-Fluorouracil release profiles in PBS

## 3. Composite (Chitosan/HAP NP) scaffolds for Bone Tissue Engineering



DEX sustained release from composite scaffolds

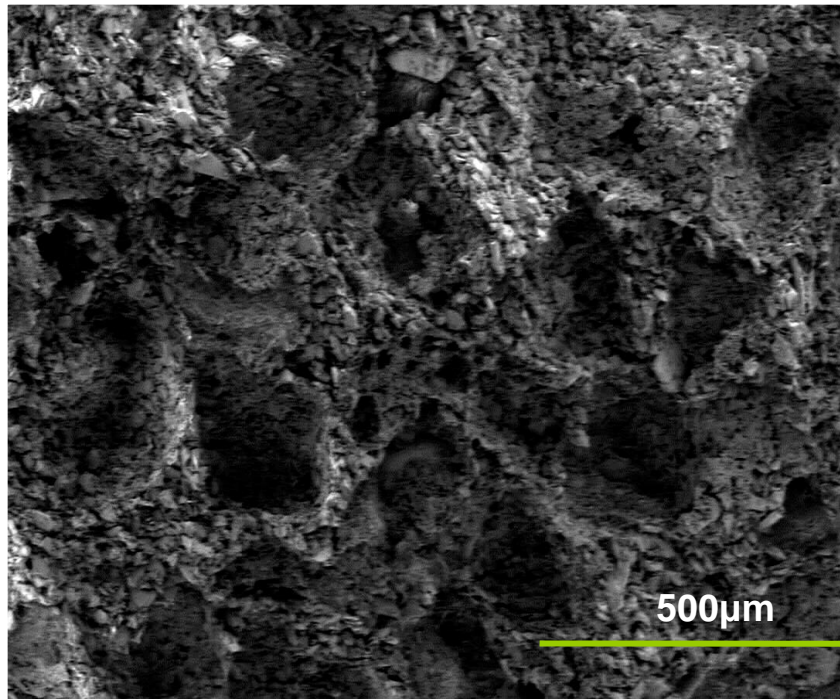




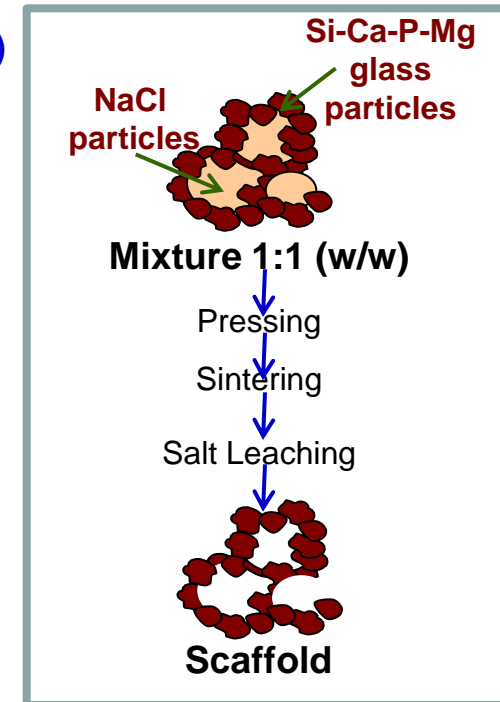
## 4. Glass-based Scaffolds for Bone Regenerative Medicine

### Salt Sintering Process

(a)

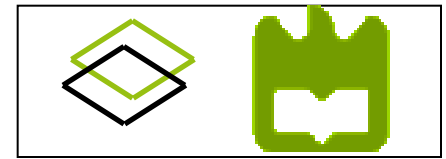


(b)



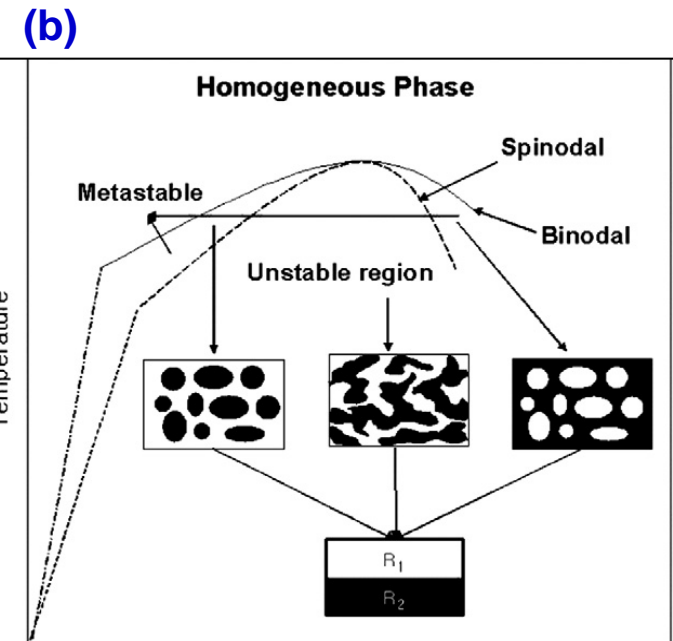
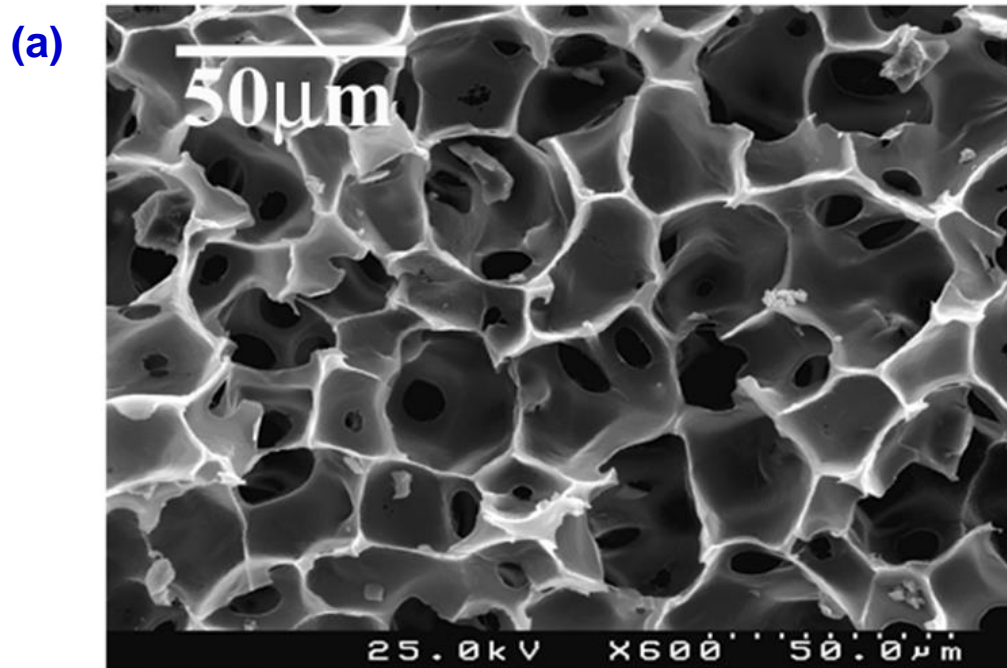
(a) SEM micrograph of a Si-Ca-P-Mg glass scaffold (Porosity – 64%, SSA – 20 m<sup>2</sup>/g) and (b) Schematic methodology of the salt sintering process (Davim, E. et al, submitted, 2014)





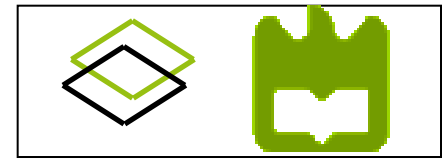
## 4. Glass-based Scaffolds for Bone Regenerative Medicine

### Thermal Induced Phase Separation (TIPS)



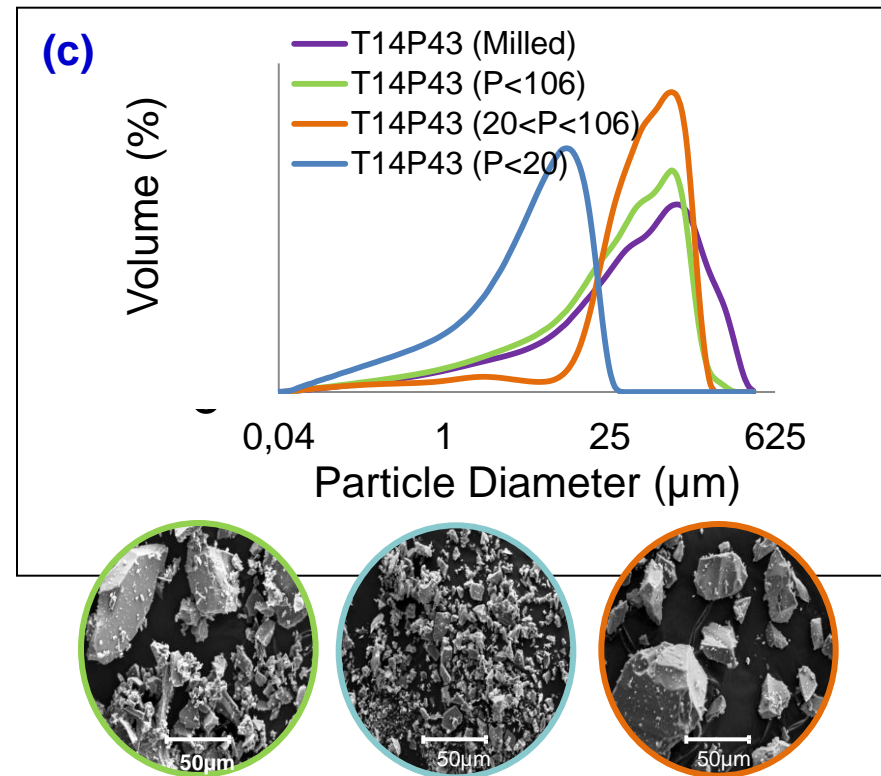
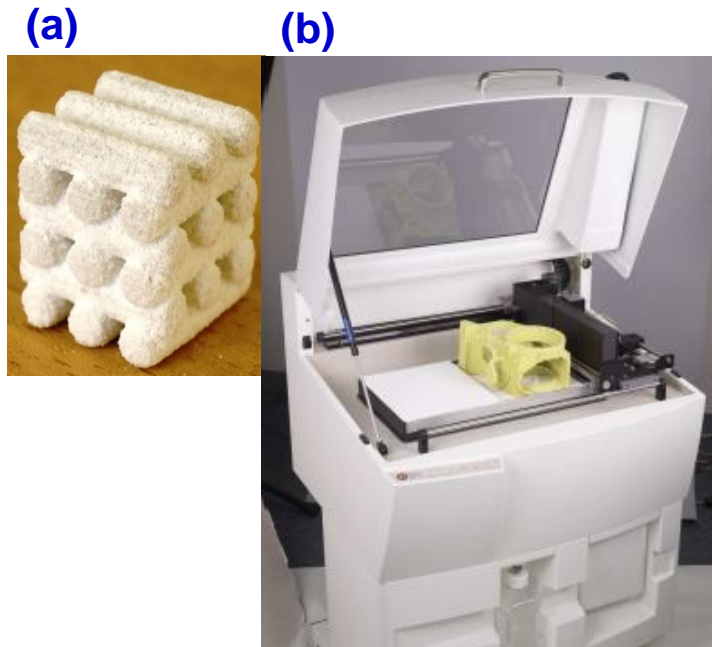
(a) SEM micrograph of a composite PLLA-50% Si-Ca-P-Mg glass produced by TIPS and (b) Schematic temperature-composition phase diagram of polymer solution. R1, polymer-lean phase; R2, polymer-rich phase.

(Barroca, N. et al, *Acta Biomaterialia* 6, 3611–3620, 2010)

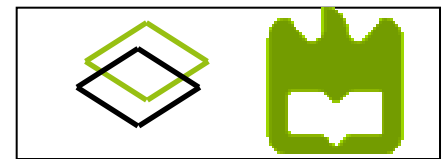


## 4. Glass-based Scaffolds for Bone Regenerative Medicine

### 3D Printing



(a) Prototype from a (b) ZPrinter 310, Zcorporation and (c) Particle size distribution of Ti-Ca-P glass powders with SEM micrographs of the different particle sizes after separation (Pires L, Master Thesis, 2011)



### Raw materials synthesis

- autoclaves
- Furnaces
- Spray-dryer

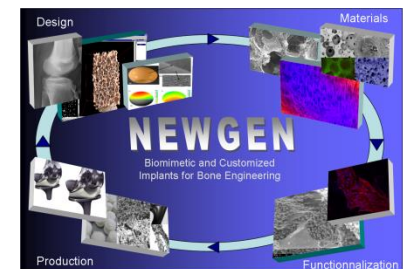


### Characterisation

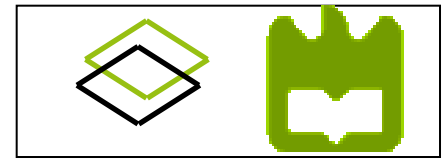
grain size

specific surface area (BET) XRD,  
IR, NMR, ICP, Atomic Absorption, UV

Zeta potential measurements





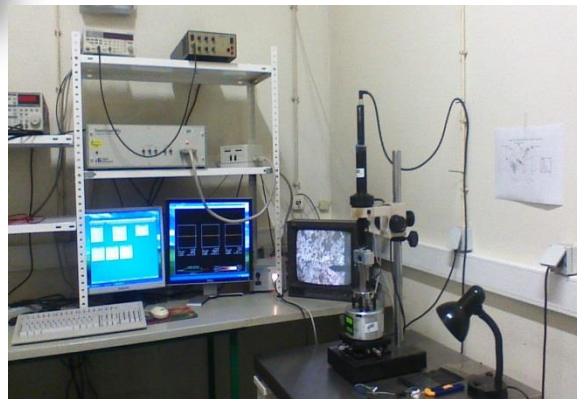


### Characterisation



**SEM Hitachi (SU-70)**

**AFM**



**TEM JEOL  
(2200FS)**