CIS – BioPi lab GENERAL PRESENTATION



- Complete denomination: Center for Biomedical and Healthcare Engineering
- Location (city, country): Saint-Etienne, France
- Director: Prof. Stéphane Avril
- Contact person in NEWGEN: Nathalie Douard
- Working Group involvement: WG1
- **Staff:** 23 permanents, 37 post graduated students
- Research topics:

Calcium phosphate ceramics for Bone Tissue Engineering Applications

Researchers expertise:

Physico-chemistry: calcium phosphates synthesis and characterization

Ceramist: material shaping and sintering



CIS – BioPi laboratory Ecole des Mines 158, cours Fauriel 42023 Saint Etienne



CIS – BioPi lab BIOMATERIALS/NEWGEN TOPICS





COST Action MP1301

EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

BIOMATERIALS/NEWGEN TOPICS

CaP synthesis and characterization

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Control of the phase composition and chemistry

- HA, β-TCP, calcium deficient hydroxyapatite
- Carbonated apatite: type A, B and A/B (CHA)
- Silicon substituted hydroxyapatites (SiHA)
- Carbo-silicated hydroxyapatite (CSiHA)
- Functionalization

Modulation of ceramics bio reactivity through their chemistry

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Bioceramics shaping and sintering

Control of the macro and micro architecture

- Additive manufacturing
- Template casting process
 - Interconnected macroporous ceramic
 - Complex 3D shape
- Spray drying

Modulation of ceramics **bio reactivity** through their **architecture**















CIS – BioPi lab BIOMATERIALS/NEWGEN TOPICS



Biological / biochemical evaluation

 In vitro bone tissue: cell function and bone remodeling in bioreactor Coll. LBTO – St Etienne





- In vivo evaluation: osteogenesis and biodegradation evaluation
 Coll. B2OA Paris
- *In vitro* characterization: biochemical properties

Coll. ICSM – Centre de Marcoule











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FACILITIES



Powder preparation

- **Synthesis** station: capacity from 500 mL to 5 L
- High capacity freeze dryer
- High capacity **centrifuge**
- Planetary ball mill
- Spray dryer lab and pilot



- Debinding furnace
- Tubular furnace under controlled atmosphere (P_{CO2} , P_{H2O} ...)







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Physico-chemical characterization

- Access to physico-chemical characterization of powder / material (XRD, FTIR, XPS...)
- Access to microscopy platform (SEM, TEM, X-ray Tomography...)
- ATG/TD up to 1750°C
- Nanozetasizer

Biological evaluation

- Cell culture lab
- Spectrophotometer
- Fluorometer





C3H10T1/2 cells cultured on hydroxyapatite /



FACILITIES



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