GENERAL PRESENTATION

- **Complete denomination**: Jožef Stefan Institute, Engineering Ceramics Dept.
- > Location (city, country): Ljubljana Slovenia
- > Director: prof. dr. Jadran Lenarčič
- Contact person in NEWGEN: prof. dr. Tomaž Kosmač; Asst.prof. dr. Kristoffer Krnel
- Working Group involvment: WG 1 and 3
- Staff: 4 PhD (3FT + 1PT) researchers, 2 post-graduate students, 2 technicians

Research topics: The basic research comprises phenomena relevant to the materials synthesis and component fabrication as well as mechanisms leading to degradation of engineering ceramic structures under operating conditions.

Researchers expertises: The applied research work is focused on new applications of engineering ceramics, development of novel, high strength, wear-, corrosion- and/or heatresistant materials and development of alternative, cost effective and environmental friendly ceramic technologies.



<u>JSI</u> Jozef Stefan Institute Jamova 39 Si-1000 Ljubljana, SLOVENIA



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BIOMATERIALS/NEWGEN TOPICS

Engineering Ceramics Department: research program and expertise

- Composition structure microstructure properties
 - "Traditional" engineering ceramics

(Al₂O₃, ZrO₂, ZTA, mulit, Si3N4, SiAION-i, SiC, AIN, C/C-SiC, ...

- new multifunctional materials
 - particulate composites
 - layered composites with ribbon-like structure
 - C/C-SiC composites
 - porous bio-ceramics
- Research in Ceramic processing:
 - aqueous/nonaqueous powder processing
 - homogeneous/selective adsorption of aditives
 - net-shaping of green bodies (LPIM, HAS, CAD-CAM)
 - deformation processing
 - Sintering (HP, HIP, SPS)
 - machining









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BIOMATERIALS/NEWGEN TOPICS

• "Jožef Stefan" Institute

Engineering Ceramics Department: Bio-medical research

- Y-TZP as a material for dental restorations
 - adhesion
 - ageing, low temperature degradation
 - reliability, lifetime prediction (methodology)
 - compatibility with veneering porcelain



Ageing - in vitro



- in vivo



BIOMATERIALS/NEWGEN TOPICS

Engineering Ceramics Department: Bio-medical research

- Influence of surface treatment of dental ceramics
 - sandblasting



Adhesion coatings on Y-TZP











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BIOMATERIALS/NEWGEN TOPICS



Optimisation

• Dental posts development



Clinical testing



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BIOMATERIALS/NEWGEN TOPICS

Engineering Ceramics Department: Bio-medical research

- Development and biocompatibility testing of new ceramic materials



Soaking in SBF solution

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Electroconductive engineering and bio-ceramics ceramics



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BIOMATERIALS/NEWGEN TOPICS

Engineering Ceramics Department: Bio-medical research

TCP-800

TCP-900

CP-1100

Bioactive coatings trough biomimetic deposition

3 hours of imersion in biomimetic solution

6 hours of imersion in biomimetic solution OCP CDHA

Pull-off strength: 1.8 ± 0.4 MPa

Porous bio-ceramics

Porous Y-TZP with improved strength – core-shell concept







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Heating of the biomimetic CaP coatings at 800, 900 and 1100 $^\circ \rm C$

Pull-off strength: 47.8 ± 4.7 eMPa

52.3 ± 3.8

32.9 ± 7.2

BIOMATERIALS/NEWGEN TOPICS

Engineering Ceramics Department: research equipment

- Heat treatment equipment
 - SPS Dr.Sinter
 - Furnaces for sintering in air up to 1800°C
- Analytical equipment
 - particle size analyser
 - ZETA potential analyser
 - BET
 - Mercury porosimetry
 - Liquid cell AFM
 - rotational viscosimeter
 - sintering dilatometer
 - mechanical testing machine
 - HotDisk
 - SEM with EDX and WDX
 - HRTEM with EDX and EELS
- Laboratory machine for LPIM prototipe production





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