

## Bioceramics, Spring 2018

*Bioceramics, 7,5 hp (7,5 ECTS) KZ8002*

Examination based on quizzes and project reports

Course code: KZ8002

Course period D: Mon 30/4-Fri 1/6

### Lecturer:

James Shen

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**Literature:** James Shen and Tomaž Kosmač “Advanced Ceramics for Dentistry” (Elsevier)

### Project work

1. Microstructure and mechanical properties of a dental composite

To characterize the microstructure and mechanical properties of a newly developed dental composite composed of resin and ceramic fillers by indentation, SEM, IR, Raman and XRD. The work will focus on understanding the structure-properties relationship.

2. Strain and surface nano-roughening of zirconia ceramics induced by local impact deformation

Nano-indentation type of impact will be introduced by sandblasting on the surface of zirconia ceramics. The surface strain and topography will be characterized by SEM, XRD and Raman spectra. The correlation between the formed surface strain/topography and sandblasting condition (distance, pressure) will be established.

### Organization

Estimated number of students: around 12

Two project groups

### Lecture schedule

All lectures will be given in seminar room (C516)

Date	Content
<b>Week 18</b>	
Monday 30/4 9:00 - 11:30	<b>Lecture 1.</b> Course information, introduction and Ceramics: from pottery to advanced components Bioceramics is a young member of a large family with very long history <i>Refer to Chapter 1, 11, 12</i>
Wednesday 2/5 9:00 - 11:30	<b>Lecture 2.</b> Phase composition and microstructure Ceramics belong to the largest family of man-made materials that one can find everywhere and any time. <i>Refer to Chapter 6, 8</i>
Friday 4/5 9:00 - 11:30	<b>Lecture 3.</b> Ceramic processes powder preparation, green body formation and sintering <i>Refer to Chapter 7</i>
<b>Week 19</b>	
Monday 7/5	<b>Lecture 4.</b> Structure-property relationships

9:00 - 11:30	Intrinsic properties of the crystal grains; Properties initiated by grain boundary; The grain size and morphology effect, microstructure tailoring; Tailoring of microstructure <i>Refer to Chapter 6, 9</i>
Wednesday 9/5 9:00 - 11:30	<b>Lecture 5.</b> Defects retard the potential of advanced ceramic, the accumulation of defects during the ceramic process <i>Refer to Chapter 5, 17</i>
Friday 11/5 9:00 - 11:30	<b>Lecture 6.</b> Ceramics at the biology interfaces, fundamental interactions, osseointegration <i>Refer to Chapter 10, 16</i>
<b>Week 20</b>	
Monday 14/5 9:00 - 11:30	<b>Lecture 7.</b> Ceramics for Orthopaedic and dental implants, The application of structural ceramics for bio-purposes <i>Refer to Chapter 4, 13</i>
Wednesday 16/5 9:00 - 11:30	<b>Lecture 8.</b> Scaffolds for bone tissue engineering <i>Refer to Chapter 13</i>
Friday 18/5 9:00 - 11:30	Project work
<b>Week 21</b>	
Monday 21/5 9:00 - 11:30	Project work
Wednesday 23/5 9:00 - 11:30	<b>Lecture 9.</b> Industrial production of customized ceramic prostheses <i>Refer to Chapter 3, 15</i>
Friday 25/5 9:00 - 11:30	<b>Lecture 10.</b> Subtractive vs additive manufacturing, customized parts with customized functions <i>Refer to Chapter 18</i>
<b>Week 22</b>	
Monday 28/5 9:00 - 11:30	Project work
Wednesday 30/6 9:00 - 11:30	Presentation of the projects
Friday 1/6 9:00 - 11:30	<b>Examination (C516 North)</b>

### Project schedule

Detail plan for projects will be described in a separated document.

Projects will be performed in the afternoon section during week 19-22.