



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

Senior Design Project Description

Company Name	UNCC Biomedical Engineering	Date Submitted	8/3/2018
Project Title	Coating Bioceramic on titanium alloy dental implant material (BIO_COAT)	Planned Starting Semester	Fall 2018

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person.

Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	4	Electrical	
Computer		Systems	
Other ()			

Company and Project Overview:

Provide background information about the company, and an overview about the context for the project.

The goal of this project is to develop a protocol to coat bioceramic on medical grade Ti alloy dental implant material. Coating Ti alloy with bioceramic minimizes the corrosion and enhances the implant fixation. The project can be broken down into four parts; A) Measurements of the zeta potential of the bioceramic particles to select the suspending medium, B) Build the apparatus for electrophoretic deposition, C) Coat the ceramic on the Ti alloy discs and optimize the electric potential and coating time, D) thermal treatment of the ceramic-coated Ti alloy and measure the adhesion strength at the ceramic-metal interface.

Project Requirements:

This is a more detailed description of the design problem, project objectives and the desired output – describing the scope and specifications for what the project team will actually be designing and producing.

Scope:

This project aims at improving metallic implant fixation and longevity. Ti alloy implant material is widely used in orthopedic and maxillofacial surgery. Bioceramic coating enhances tissue integration with the metallic implant.

Specifications:

1. The bioceramic coating has to be homogenous on the surface of the metal.
2. The thickness of the bioceramic coating layer has to be 3-6 microns
3. The adhesion strength at the ceramic-metal interface has to be greater than 30 MPa



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according to the ASTM standards.

Expected Deliverables/Results:

- *Bulletized list of all deliverables that the team is to provide to the supporter at the end of the project. Be specific here to avoid misunderstandings.*
 - Measure the electrophoretic mobility of the bioceramic particles in ethanol and water
 - Calculate the zeta potential of the bioceramic particles
 - Determine the electrophoretic coating parameters essential for thin homogenous coating
 - Develop a thermal treatment protocol to enhance the adhesion strength at the ceramic-metal interface
 - Analyze the ceramic coating using spectrometry and electron microscopy
 - Measure the adhesion strength at the ceramic metal interface.
 - Determine the mechanical properties of the porous ceramic
 - Analyze the porosity and pore size of the porous ceramic

Disposition of Deliverables at the End of the Project:

Hardware developed is the property of the Industry Supporter. Please specify what disposition you would like for the hardware developed by the Project team. Typically the work product is displayed at the last Expo then immediately handed over to the supporter unless arrangements have been made to deliver at a future date.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

- Prior background in materials engineering or basic chemistry or physics would be a plus