



# Fraunhofer

## USA

### **Undergraduate or Graduate Intern**

#### **Overview**

Fraunhofer USA, Inc. Center Midwest is located on the campus of Michigan State University in East Lansing, Michigan, USA. We are currently seeking highly motivated, reliable and technically competent individuals to join our coatings group to work on the synthesis and characterization of thin films by physical vapor deposition (PVD). Our team conducts applied research on functional coatings for e.g. optical, mechanical, electrochemical, piezoelectric applications. Deposition methods utilized include e.g. magnetron sputtering (MS) with and without ion assist, or cathodic vacuum arc (CVA). The thin films are commonly characterized by spectroscopical (UV-Vis-NIR, laser acoustic wave), microscopical (atomic force, scanning electron), and/or electrochemical methods. As a member of our international team, you will help design and conduct experiments, generate data and present data in a meaningful report. You will conduct internal research as well as industry funded research projects in real time within a state-of-the-art research and development facility.

#### **Current areas of research include**

- Development, fabrication and, testing of nitrogen-incorporated tetrahedral amorphous carbon thin films for electrochemical sensing
- Ion beam assisted magnetron sputtering of oxides and nitrides
- Magnetron sputtering of metals, oxides, and nitrides
- Characterization of the above-mentioned thin films by stylus profiler, laser acoustic wave spectroscopy (LAWave®), ultraviolet, visible and near Infrared (UV-Vis-NIR) spectroscopy, atomic force microscopy (AFM), four-point probe (4pp) among others

## **Responsibilities**

- Assist Coatings Technology Group with projects as assigned:
  - Sample preparation for thin film deposition
  - Operation and preparation of physical vapor deposition (PVD) equipment (e.g. magnetron sputtering, cathodic arc evaporation)
  - Operation of analytical equipment
- Suggests and implements ideas for process improvements, the adaptation of new technologies and novel research concepts
- Data collection and reporting in scientific format

## **Required Qualifications**

- Bachelor's or master's degree (or currently pursuing either) in material science, applied physics, applied chemistry or any related field
- Experience working in a laboratory
- Interest in thin films and/or material science
- Willingness to consider a 9 month to 1-year commitment
- Familiarity with Microsoft Office Software

## **Contact**

Please send cover letter and resume to Ms. Nina Baule ([nbaule@fraunhofer.org](mailto:nbaule@fraunhofer.org), Technical Lead) and Mr. Michael Becker ([mbecker@fraunhofer.org](mailto:mbecker@fraunhofer.org), Administration Director).

<b>Project Title</b>	
Field Research Interest	Thin film deposition of amorphous carbon, metals, oxides, and nitrides
Abstract of the project <sup>1</sup>	<p>Fraunhofer USA, Inc. Center Midwest is located on the campus of Michigan State University in East Lansing, Michigan, USA. We are currently seeking highly motivated, reliable and technically competent individuals to join our coatings group to work on the synthesis and characterization of thin films by physical vapor deposition (PVD). Our team conducts applied research on functional coatings for e.g. optical, mechanical, electrochemical, piezoelectric applications. As a member of our international team, you will help design and conduct experiments, generate data and present data in a meaningful report. You will conduct internal research as well as industry funded research projects in real time within a state-of-the-art research and development facility.</p> <p>Current projects include: Fabrication and testing of nitrogen-incorporated amorphous carbon electrodes for electrochemical sensing, magnetron sputtering with and without ion beam assist of metals, oxides and nitrides for optical, piezoelectric, or mechanical coatings</p>
Tasks	<p>Operation of PVD equipment including sample and vacuum chamber preparation (e.g. magnetron sputtering, cathodic vacuum arc)</p> <p>Characterization of mechanical (laser acoustic wave spectroscopy), optical (UV-Vis-NIR spectroscopy), electrical (four-point probe), electrochemical (cyclic voltammetry), and morphological (atomic force microscopy, scanning electron microscopy) properties of thin films</p> <p>Suggests and implements process improvements, adaptation of new technologies and novel research concepts</p> <p>Data collection and reporting in scientific format</p> <p>Data analysis utilizing: Origin Pro, MS Excel, MS PowerPoint</p>

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<sup>1</sup> Wherever possible, please avoid job-related terms such as “work” (=> project, research) and “internship” (=> research opportunity, research stay).

Learning Outcomes <sup>2</sup>	Professional skills: vacuum systems specifically PVD systems, thin films growth methods and models, microscopy and spectroscopy methods, material properties  Intercultural competences and social skills by collaborating with an international team  Problem solving skills by suggesting and implementing ideas for process improvements independently
Requirements	Bachelor's or master's degree (or currently pursuing either) in material science, applied physics, applied chemistry or any related field  Experience working in a laboratory  Interest in thin films and/or material science  Willingness to consider a 9 month to 1-year internship
Language Skills	English
Software Skills	MS Office, optional: Origin Pro, Matlab, Python
Other skills	
Duration of the project	9-12 months
Type of research project	Applied research
Responsible Professor	Prof. Dr. Wen Li, Michigan State University
Supervisor/Mentor	Nina Baule, M.Eng., Fraunhofer USA

<sup>2</sup> Please consider learning outcomes and/or choose applicable skills from the list below and mention how they will be acquired by the student:

- professional skills e.g. *by using tool X / learning skills Y / using software Z*
- intercultural competences and social skills *by collaborating with an international team*
- (virtual) collaboration skills *by interacting with a team of X people via platform Y*
- (virtual) communication skills *by...*
- problem solving skills *by...*
- the purposeful use of networked online tools *by...*
- active, self-regulated learning skills *by...*
- autonomous learning skills *by...*
- etc...

Supervisor`s Telephone Number	Email first, and Zoom/Teams call is available
Supervisor`s Email	nbaule@fraunhofer.org
Faculty, Institute or Company Name	Fraunhofer USA, Center Midwest, Diamond and Coatings Technology Division
Address	1449 Engineering Research Court, B100, East Lansing, MI 48824, USA
Can your project be completed virtually if global travel is not allowed or restricted in 2024?	No, on site