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, Technical Lead) and Mr. Michael Becker (mbecker@fraunhofer.org, Administration Director).
**Abstract of the project**

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. 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.

**Tasks**

Operation of PVD equipment including sample and vacuum chamber preparation (e.g. magnetron sputtering, cathodic vacuum arc)

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

Suggests and implements process improvements, adaptation of new technologies and novel research concepts

Data collection and reporting in scientific format

Data analysis utilizing: Origin Pro, MS Excel, MS PowerPoint

---

1 Wherever possible, please avoid job-related terms such as “work” (=> project, research) and “internship” (=> research opportunity, research stay).
| Learning Outcomes² | 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 |

² 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...
<table>
<thead>
<tr>
<th>Supervisor’s Telephone Number</th>
<th>Email first, and Zoom/Teams call is available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor’s Email</td>
<td><a href="mailto:nbaule@fraunhofer.org">nbaule@fraunhofer.org</a></td>
</tr>
<tr>
<td>Faculty, Institute or Company Name</td>
<td>Fraunhofer USA, Center Midwest, Diamond and Coatings Technology Division</td>
</tr>
<tr>
<td>Address</td>
<td>1449 Engineering Research Court, B100, East Lansing, MI 48824, USA</td>
</tr>
<tr>
<td>Can your project be completed virtually if global travel is not allowed or restricted in 2024?</td>
<td>No, on site</td>
</tr>
</tbody>
</table>