Fabrication of Nanostructures by Ion Beam on Semiconductor Materials and Data Analysis using Deep Learning

Project Leader
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1. Objective

This project is aimed at:

Basic and applied research on the fabrication of nanostructures in semiconductor materials using ion beam. The interaction between the ion beam and the material can be clarified from the behavior of lattice defects. Analytical electron microscopy with atomic resolution is used for this purpose. In advanced research, the investigation of nanostructures is focused on electronic and optical properties for semiconductor device applications. Deep learning is used for data analysis to automatically measure the size and angle from the electron microscope images, to determine the regularity, and to predict the structure formed from the experimental conditions. From the experiment and data science, a series of studies on the fabrication of nanostructures by ion beam can be conducted reliably and consistently.

2. Project Outline

To that end, the project will consist of the following phases:

(a) Fabrication of nanostructures by ion beam on semiconductor materials (Si, Ge, III-V, IV-IV, II-VI)
(b) Data analysis using deep learning

3. Expected Performance

In this project, the successful candidate would be expected to:

(a) fabricate nanostructures
(b) analyze data using modern data science techniques (DNN)

4. Required Skills and Knowledge

The successful candidate for this project will have the following knowledge and skills:

(a) Materials science
(b) Solid state physics
(c) Scanning electron microscopy (SEM)
(d) Transmission electron microscopy (TEM)
(e) Focused ion beam (FIB)
(f) Python coding & programming

References

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T. Oishi, N. Nitta, Nanoporous structure formation on the surface of Ge by ion beam irradiation, J. J. Appl. Phys. 57, pp. 0913101-1-6, (2018).

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