

# Nanowire electron gun for cheaper, smaller and better electron microscopes

National Institute for Materials Science/Han Zhang

## Future Society Image

In the future society, manufacturing will all become nanoscale. In order to see and manipulate nanoscale objects, one must use electron microscopes because electron is with small wavelength. However, current electron microscopes are very expensive and large in size. I am dedicated to using nanotechnology to revolutionize electron microscopes to be cheaper, smaller and better.

## Core Technology

Instead of the conventional metal machining way of making electron microscopes, we will rely on nanomaterials and nanoscale fabrication method to make new generation electron microscopes. While conventional electron source needs heating over 1000 degree C and a few thousand volts to operate, the nanowire electron source operates at room temperature with only a few hundred volts. It is also a million times smaller in size.

## Overview

- Purpose: In this support project, I made a compact high brightness electron gun using a nanowire electron source to improve existing compact electron microscopes.
- Outcomes: We made a nanowire based field emission gun which is 1/40 of the size of a conventional field emission gun. (Left figure) The electron gun was installed onto a commercial table-top SEM to replace its original high temperature electron gun. Immediately the microscope resolution was improved without changing any other microscope components. (Right figure)



- Future Plan: We seek to also make other types of electron microscopes cheaper, smaller and better with this nanowire electron gun. Commercialization is also planned.

## 【Contact】

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