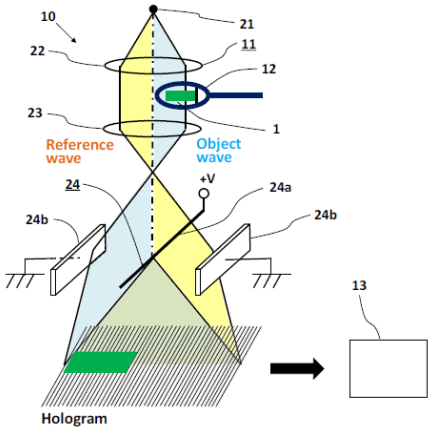
Tohoku Univ. Technology

Method for creating electron-beam hologram, magnetic filed information measurement method and magnetic field information measuring device

Possible to visualize the effect of electrons when a magnetic field is applied, and observe & evaluate electron/spin distribution!



1. Sample
10. Magnetic field information measurement device
11. Electron beam hologram creation method
21. Electron beam source
22. Condenser lens
23. Objective lens
24. Biprism
24a. Quartz glass wire
24b. Ground electrode
12. Magnetic field application mean
13. Magnetic field information acquisition mean

Overview

So far, the electron holography has been used to visualize the electric & magnetic fields at nanoscale or the movement of electrons due to charging in various materials. However, it has not been possible to visualize and evaluate how the magnetic field applied to a sample affects the secondary electrons existing on the sample surface or around the sample surface.

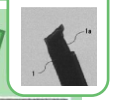
This invention is able to provide a method for creating electron holograms, a method and a device for measuring magnetic field information that can visualize & evaluate the effect of the applied magnetic field on the secondary electrons existing on the sample surface or around the sample surface. This invention is characterized by the creation of an electron beam hologram by interfering an object wave consisting of an electron beam affected by the sample where a magnetic field is applied, and a reference wave consisting of an electron beam which is not affected by the sample.

Product Application

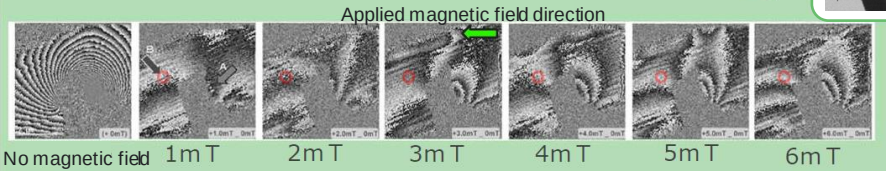
- Spintronics device development
- Research of magnetic phenomena in extremely small area
- Research of the relationship between magnetic properties and physiological function of a biological tissue and cell

Relative change in the magnetic flux density with the increase of applied magnetic field

TEM image at same position

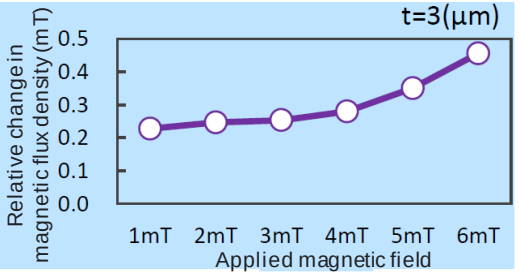


Phase reproduction image with 3x amplification when subtracting the phase reproduction image without magnetic field.



Relative change in magnetic flux density due to secondary electrons near the insulator sample (marked as ○)

t: average thickness of the secondary electrons distributed around the sample



Related Works

[1] D. Shindo, Z. Akase, Mater. Sci. Eng. R Rep. 142(2020)100564
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IP Data

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