第 1 回 ナノスピントロニクス・磁性材料科学セミナー

日時: 2022 年 12 月 13 日 (火) 13:00-14:00　工学部 5 号館 2 階　５２２講義室

共催：IEEE Magnetics Society Nagoya Chapter

講師: Prof. Atsufumi Hirohata (Univ. of York, UK) / 英国 ヨーク大学　廣畑 貴文 教授

- - - - - - -

“Non-Destructive imaging for Spintronic Devices”

Atsufumi Hirohata
Department of Electronic Engineering, University of York, United Kingdom

Recent progress in nanoelectronic devices have relied on the development of nanoscale fabrication, which can consist of over 100 layers. Such a complicated fabrication process may induce interfacial roughness and contaminations, resulting in broad distributions in their performance. To date, their interfacial quality has been evaluated by cross-sectional transmission electron microscopy, which has atomic resolution but cannot correlate the imaged interfaces directly with their performance due to the destructive nature of the sample preparation.

We have recently developed a new non-destructive imaging by scanning electron microscopy (SEM), allowing us to even achieve *in situ* imaging under the device operation [1,2]. We use a conventional SEM with controlled electron-beam acceleration, which changes the penetration depth of the beam. By comparing the images above and below the interface under investigation, we can evaluate the interfacial structure from the top of a device. Here, the acceleration voltages can be obtained using electron flight simulations. Our imaging can achieve sub-10-nm resolution under almost 100-nm-thick over layer, which can be useful for the device analysis. In this presentation, we will show the imaging of a series of magnetoresistive junctions and will discuss the feedback to their fabrication processes to improve their yields. We will also demonstrate the direct correlations between the device interfaces and their transport properties using *in situ* SEM imaging under the application of a voltage. Our imaging technique can be used for quality assurance.

[1] A. Hirohata *et al.*, *Nat. Commun.* **7**, 12701 (2016).
[2] E. Jackson *et al.*, *J. Phys. D: Appl. Phys.* **53**, 014004 (2019).

- - - - - - -

問い合わせ: 水口 将輝 (工学研究科 物質プロセス工学専攻)
Tel: 052-789-3353
e-mail: mizuguchi.masaki@material.nagoya-u.ac.jp