

第7回 ナノ空間物質プロジェクト研究会のお知らせ

概要：阪大産研・末永研では、2020年よりJST-CRESTプロジェクト”ナノ空間物質”の支援を受けて、新しいナノスケール物質の合成と応用を目指した研究を行っております。また2021年よりヨーロッパ研究会議（ERC）の支援を受けてこれら新物質を分析するための世界最高性能の電子顕微鏡開発を目指したMORE-TEMプロジェクトを進めています。

本研究会は、ナノスケール物質・電子顕微鏡・電子分光それに低次元物質を用いた基礎および応用研究で著名な研究者をお招きして、最新の物質開発を実験および理論の両面からな議論を行う場として設定されました。今回はMichigan Technological UniversityからYoke Khin Yap先生をお招きして、最近のボロンナイトライドナノ構造とその応用の可能性についてディスカッションする場を設けます。

<http://phy.sites.mtu.edu/yap/>

日時：2024年7月29日

場所：大阪大学・産業科学研究所 S412室（ハイブリッド形式）

プログラム（仮）：

14:00~14:30 「阪大・産研ナノ空間物質プロジェクトのご紹介」（30分）

阪大・産研 末永和知

14:30~15:30 「Emerging Applications of van der Waals Boron Nitride Nanostructures for Advanced Electronics and Biomedicine」（60分）

*Department of Physics, Michigan Technological University,
Yoke Khin Yap先生*

15:30~16:00 「TBA」（30分）

阪大・産研 Haiming Sun

16:00~18:00 研究室見学およびフリーディスカッション（阪大・産研 Qiunan Liu）

研究会の参加には事前登録が必要です。

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Emerging Applications of van der Waals Boron Nitride Nanostructures for Advanced Electronics and Biomedicine

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Abstract:

The electrically insulating and optically transparent hexagonal boron nitride (h-BN) nanostructures are not applicable as the transport channel of electronic and energy devices. Recent advancements in controlled synthesis of high-purity boron nitride nanotubes (BNNTs)¹⁻³ and h-BN nanosheets have enabled unique applications in advanced electronics and bio-imaging. For example, we reported using BNNTs as the one-dimensional templates for room-temperature single-electron transistors (SETs)⁴, and two-dimensional gold quantum dots with tunable optical bandgap⁵. We also reported field-effect transistors (FETs) by van der Waals Tellurium (Te) atomic chains encapsulated inside BNNTs⁶. Last but not least, we have demonstrated high-brightness fluorophores for immunophenotyping of antigens by flow cytometry.⁷ In my talk, I will discuss these emerging applications,^{8,9} and the latest use of h-BN nanostructures as high-brightness probes (HBPs) for gene and troponin protein detection.

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10. Tripathy, S. *et al.* (Submitted)

Brief Professional Biography of Professor Yoke Khin Yap

Yoke Khin Yap is a professor of physics, director of the applied physics graduate program, and an honorable University Professor at Michigan Technological University (MTU), USA. He earned his Ph.D. in 1999 from Osaka University, sponsored by the Japanese government as a *Monbusho* scholar. Before his appointment at MTU, he was a postdoctoral fellow of the Japan Society for the Promotion of Science. His research interest focuses on synthesizing nanoscale van der Waals materials and their applications in electronics, energy, and biomedicine. Professor Yap was honored with the National Science Foundation *CAREER* Award in 2005. He was a *Charter member* of the users' executive committee of the Center for Nanophase Materials Sciences at Oak Ridge National Laboratory in 2005-2007 and the first elected user group chair in 2008. Professor Yap received the *Bhakta Rath Research Award* in 2011, was appointed *Faculty Fellow* in 2014-2016, honored as an *Osaka University Global Alumni Fellow* in 2015, and received the *MTU Research Award* in 2018.

