



# "SCIENCE FOR FUTURE MOLECULAR SYSTEMS" GLOBAL SEMINAR (3)

先導物質化学研究所 講演会

## Strategies for Reducing Wear of Components Made of Si – Tribology of Ultra-thin Lubricants

**Prof. Sujeet Kumar Sinha**

Department of Mechanical Engineering  
National University of Singapore

主催：九州大学グローバル COE 「未来分子システム科学」

先導物質化学研究所

共催：九州大学高分子機能創造リサーチコア、生体工学リサーチコア

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場所：九州大学 先導物質化学研究所（伊都地区）CE11 棟 2F 会議室（福岡市西区元岡 744）

Sinha 教授は、インドのご出身で、英国 Imperial College, London で学位を取得された後、米国 NIST、日本 AIST でポストドクを経て、国立シンガポール大学の教授とられた新進気鋭の高分子トライボロジーの研究者です。先導物質化学研究所の日本学術振興会の訪問教授として来日されている機会に、講演会をしていただくことになりました。

**Abstract:** Si is among the most preferred materials for microsystems such as micro-electro-mechanical systems (MEMS). While making micro-components out of Si is very cost-effective due to the available wet-etching process, this material poses serious problem as a moving component owing to high friction and wear characteristics. The solution lies in providing ultra-thin (only 10s to 100s of nanometer thick) lubricating coating on Si that can provide acceptable coefficient of friction coupled with low adhesion and high wear life. In this talk, we will present two approaches, the first one is to apply composite monolayer of organic molecules by self-assembly process. The second approach is to provide ultra-thin coating of a polymer by a dipping process. In both cases, extensive research have been conducted in our laboratory to evaluate their friction, adhesion and wear properties vis-à-vis bare Si. We have found that the tribological (friction and wear) performance of Si can be drastically improved by having a composite layer of the self-assembled molecules or dip-coated polymer layer with a top monolayer of perfluoropolyether (PFPE). The PFPE layer provides liquid-like mobility at the surface giving low shear stress and overall high wear life to Si.

### 連絡先

〒819-0395 福岡市西区元岡 744 番地

九州大学先導物質化学研究所 分子集積化学部門 複合分子システム分野

高原 淳

Phone : 092-802-2517, Fax : 092-802-2518、e-mail : takahara@cstf.kyushu-u.ac.jp