

# *The 5th JUACEP Seminar*

第5回 名古屋大学日米協働教育プログラムセミナー

## **Conversion of Biowaste Silica to Value Added Si Based Materials**

**Lecturer: Professor Richard M. Laine**

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**Date March 6, 2012 13:30~15:00**

**Venue 021 room, ES Building**

Agricultural products used as alternative energy sources can generate considerable waste. For example, Wadham Energy of Williams, CA burns more than 220,000 tons of rice hulls/year to generate 26 MW of electricity. The byproduct is 40-50k tons/yr of rice hull ash (RHA). Even the generation of hydrocarbons from agricultural products will generate waste. This waste will be high in inorganic content, mostly silica without heavy metals, which plants do not absorb. RHA consists of 70-90 wt % low impurity, high surface area amorphous, porous silica mixed with low impurity, amorphous carbon.

We have learned to extract the silica from RHA at 90-100°C using  $\text{Me}_4\text{NOH}$  to produce a single silica product,  $(\text{Me}_4\text{N}^+)_8(\text{OSiO}_{1.5})_8$  in 90 % yields. This octaanion (OA) is spherical and basically represents the smallest single particle of silica. OA is used as a general starting point for the synthesis of a wide variety of silsesquioxane molecules of the form  $(\text{RMe}_2\text{SiOSiO}_{1.5})_8$  also called  $\text{Q}_8$  silsesquioxanes or SQs. In addition, OA can be purified to at least six 9's purity and represents a route to a variety of low cost, high surface area (400-800  $\text{m}^2/\text{g}$ ) silica, silicon metal and other Si containing materials as we will discuss in this presentation.

略歴: 1969年カリフォルニア州立大学化学部卒。1973年南カリフォルニア大学博士号（化学）取得。デラウェア大、UCサンタバーバラ、スタンフォード国際研究所研究員を経て1987年ワシントンテクノロジーセンター研究教授、1990年からミシガン大学物質科学工学部教官。1999年同大教授。Mayaterials 創設者兼CEO、高分子科学工学センター統括者、EXIMOハードコーティング社共同創設者。

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