

The 19th JUACEP Seminar

第 19 回 名古屋大学日米協働教育プログラムセミナー

“High Purity, Fumed Silica from Biogenic Silica Without Making SiCl₄”

Lecturer: Professor Richard M. Laine
Department of Materials Science and Engineering
University of Michigan

ABSTRACT:

Traditionally, fumed silica is made by combusting SiCl₄ in H₂/O₂ flames in self-contained 100 m long tubes needed to cool the fumed silica without releasing the co-generated HCl.

Agricultural byproducts used as alternate energy sources generate considerable waste. Harvested rice is milled producing rice hulls that are often burned to generate electricity also producing rice hull ash (RHA). In the U.S. some 100k tons of RHA are produced annually. RHA consists of 70-90 wt % low impurity, high surface area (20 m²/g) amorphous, porous silica mixed with low impurity, amorphous carbon. The rice plant does not extract heavy metals from the ground and as such the resulting RHA is relatively pure. Furthermore, it is very easily purified using simple acid extraction to remove small amounts of phosphates and alumina.

We have developed several methods of extracting this silica to produce a wide variety of products including high purity precipitated silica and several silane products. In this talk, we discuss the synthesis of a distillable alkoxysilane, Si(OR)₄ directly from RHA and its combustion via flame spray pyrolysis to produce high surface area (170 m²/g) fumed silica. We also compare the economics of this process with those of producing fumed silica from SiCl₄.

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。

Date: June 25 (Wed), 2014 13:00~14:00

Venue: 241 Lecture Rm. (Rm. 453), Engg. Bldg. II

*** 事前参加申込み不要**

The 20th JUACEP Seminar

第 20 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 Including Polymers and High Purity Silicon”

Lecturer: Professor Richard M. Laine
Department of Materials Science and Engineering
University of Michigan

ABSTRACT:

Agricultural byproducts used as alternate energy sources generate considerable waste. Harvested rice is milled producing rice hulls that are often burned to generate electricity also producing rice hull ash (RHA). In the U.S. some 100k tons of RHA are produced annually. RHA consists of 70-90 wt % low impurity, high surface area (20 m²/g) amorphous, porous silica mixed with low impurity, amorphous carbon. The rice plant does not extract heavy metals from the ground and as such the resulting RHA is relatively pure. Furthermore, it is very easily purified using simple acid extraction to remove small amounts of phosphates and alumina. We have developed several methods of extracting this silica to produce a wide variety of products including high purity precipitated silica and several silane products. Furthermore, the resulting silica depleted RHA or SDRHA has C:SiO₂ ratios of value for electric arc furnace processing of silicon metal. We describe a route to 5-6 nines purity silicon with costs that are 30 % of traditional chlorosilane processing costs.

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Date: June 25 (Wed), 2014 14:00~15:00

Venue: 241 Lecture Rm. (Rm. 453), Engg. Bldg. II

*** 事前参加申込み不要**

問合せ：世界展開力強化事業事務局(内線 2799)

Inquiry: Japan-US Advanced Collaborative Education Program Office (Ext. 2799)