

The 18th JUACEP Seminar

第18回 名古屋大学日米協働教育プログラムセミナー

“A low cost, green route to distillable spirosiloxanes via base catalyzed depolymerization of biogenic silica”

Lecturer: **Professor Richard M. Laine**

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ABSTRACT:

A grand challenge in silicon chemistry is the depolymerization of silica using chemical means to produce silicon-containing compounds without first having to reduce SiO₂ with C using carbothermal reduction in an electric arc furnace at 1900°C to produce metallurgical grade silicon or Simet and then oxidize it back to Si(OR)₄ as a means to make distillable compounds that offer access to high purity materials for multiple applications ranging from novel alkyl and arylsiloxanes to fumed and precipitated silicas.

Direct depolymerization of silica has been explored over the last 80 years as a potential solution to the Simet synthetic pathway with no success in producing distillable aryl or alkoxy silanes. We now report success in this matter using RHA and other biogenic silica sources.

RHA is produced in 100,000 ton/year quantities in the U.S. alone from the burning of rice hulls, a byproduct of rice milling. As produced it consists of amorphous, biogenic silica (typically 90 wt %) with surface areas >20 m²/g. We describe here efforts to promote catalytic depolymerization of this silica at temperatures of 160-240°C using minimal amounts of base in multiple diol media. . Selected bulky diols provide access to spiroiloxanes that are base stable and can be distilled to high purity directly from the reaction solution. Following concentration of the reaction solution, the base can be recovered and recycled. The product spiroiloxanes silica can either be precipitated or fumed using a variety of traditional techniques as discussed elsewhere

This approach represents a potentially new paradigm in the production of alkoxy silanes and precipitated silicas in high purity and at very low cost compared to the traditional Simet and sodium silicate processes currently used commercially world-wide.

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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Venue: IB013 (IB Building)

*** 事前参加申込み不要**

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