博 士 論 文 公 聴 会

ご 案 内

下記の要領で博士論文公聴会を開きますのでご来聴下さい。

記

日　時　：　２０１５年8月１１日（火）１５：００～１７：００

場　所　：　理学研究科Ｆ棟２階セミナー室（Ｆ２２７）

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題　目　：　Microscopic characterization of diatoms and their changes with heating by infrared (IR) micro-spectroscopy
(顕微赤外分光による珪藻の特性とその加熱変化の評価)

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論文要旨 ：

In order to characterize a representative biomineral, washed present day centric diatom samples (Diameter: 100-350μm) have been analyzed and imaged by infrared (IR) micro-spectroscopy and Scanning Electron Microscopy (SEM). After careful evaluation of void effects, maturity of diatom silica frustules is considered to increase with 1220cm-1/1070cm-1 peak height ratios (opposite trend to the void effect) by IR micro-spectroscopy, associated with the increase of average thicknesses by optical microscope and the decrease of void area percentages by SEM. These IR micro-spectroscopic data with careful void effect evaluation may be applied to physicochemical structures of many other bionanomaterials including biominerals.

In situ heating IR transflection micro-spectroscopy has been conducted on unwashed diatom frustules on Al plates to examine transformation processes upon heating of aliphatic CHs, proteins and silica for simulating their changes with burial-diagenesis. Assuming the two first order reaction model (faster and slower rates), the kinetic parameters (reaction rate constants k1 and k2 and activation energies Ea) for aliphatic CHs (CH2 and CH3), proteins (amide I and amide II bands) and silica (the 3650cm-1 band due to stretching of O-H bound to Si and the 805cm-1 band due to symmetric Si-O-Si stretching vibration) were evaluated. The obtained results suggest possible interactions of 1) decreases of aliphatic CH2 and amide I and 2) silica transformation (SiOSi increase) and slower decrease rates k2 of aliphatic CHs and amide I, during the heating of diatom frustules.

Comparison of obtained results with literature data suggest that organic transformation reactions including protein degradation and generation of aliphatic hydrocarbons inside the diatom silica frustules might be different from those of proteins and/or kerogens separated from the biological structures. Although further studies are needed, importance of organic-inorganic interactions should be noted during the burial-diagenesis of diatom frustules.