



グローバル COE 物質科学イノベーション講演会

演 題 : Substrates for SEIRA and SERS produced by electroless deposition and microemulsions

講 師 : Prof. Peter Griffiths

Department of Chemistry, University of Idaho, Moscow, ID 83844-2343, USA email: pgriff@uidaho.edu



日 時 : 2010年10月8日 (金) 04 : 00 – 15 : 00

場 所 : 創成科学研究棟 4階セミナー室B-C

共 催 : 日本分光学会北海道支部、日本化学会北海道支部、日本分析化学会北海道支部、触媒化学研究センター

要 旨 :

Many ways of fabricating substrates for surface-enhanced Raman scattering (SERS) have been described but most are time consuming to make and few give reproducibility much better than $\pm 10\%$. Far fewer ways of fabricating substrates for surface-enhanced infrared absorption (SEIRA) have been reported, with most of the earliest work having been carried out by physical vapor deposition of gold and silver onto appropriate substrates (often a ZnSe internal reflection element.) The preparation of substrates for SERS and SEIRA by electroless deposition involves the spontaneous reduction of metal ions (usually Ag^+ or AuCl_4^-) by germanium or silicon. In its simplest manifestation, a Ge disk is simply immersed in a dilute solution of the appropriate metal salt for a time that depends on the concentration of the salt and the desired morphology of the deposited metal. When Si disks are used, the oxide layer is removed by incorporating dilute HF in the solution. Different conditions are usually required to achieve the optimum enhancement factor for SERS or SEIRA. We have shown that the SERS enhancement factor of thiols increases when silver-coated Ge disks are left in an aqueous environment for a few hours. SEM images suggest that the particles are becoming smoother by a process of Ostwald ripening but a combination of TEM and Raman microspectroscopy shows that SERS hot spots are being formed during the ripening process when two nanoparticles merge.

In a separate project, the preparation of small (< 5 nm) monodisperse nanoparticles has been accomplished by forming the nanoparticles in reverse micelles. Particles with a reproducible size as small as 2 nm have been prepared in this way. Transferring the particles to a suitable substrate has proved challenging but both SEIRA and SERS spectra have been acquired from particles fabricated using this technique.

*** 本講演は、総合化学特論II(Special Lecture 2010-II, Modern Trends in Chemical Sciences and Engineering II) ならびに総合化学特別研究第二 (Research in Chemical Sciences and Engineering II) の一部として認定されております。**

なお、本講演は、日本分光学会北海道支部主催のSymposium on Advanced Spectroscopy (<http://www.cat.hokudai.ac.jp/osawa/SAS.pdf>) の一部になっています。あわせてご参加ください。(参加費 : 無料)

問合せ先 : 触媒化学研究センター 大澤雅俊 (内線 : 9123) osawam@cat.hokudai.ac.jp