Nanohour

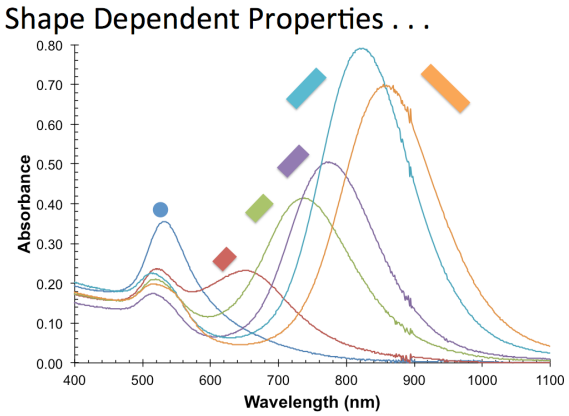
Wednesday, December 10, 2014, 3:00 pm

Beckman Institute – Room 4269

Mastering Gold Nanorod Synthesis:
A Multivariate Factorial Design of Experiments

Nathan Burrows, Materials Chemistry

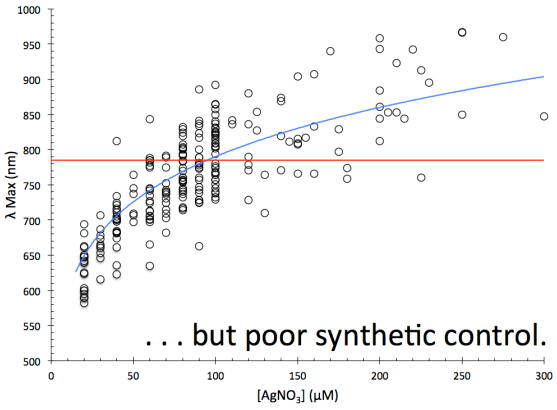
Postdoctoral Fellow with Professor Catherine J. Murphy



Since discovery of the seed-mediate synthesis of gold nanoparticles around the beginning of the 21st century, research into their synthesis and application has exponentially expended. This is in part due to their numerous, high-value applications (e.g., biomedical imaging, sensing, and drug delivery) due to morphological dependent physical properties.

However, progress in improving the yield of gold nanorods has been arduous at best. Furthermore, some synthetic control has been found through trace amounts of silver nitrate; however, the process has difficulties with reproducibility, monodispersity, and morphological impurities. Multivariate factorial design of experiments allows for the measurement of multiple effects with more precision and fewer trial runs, than one-factor-at-a-time design of experiments. Multivariate factorial design of experiments detect and measure non-additive, interaction effects (i.e. coupled & higher-ordered factor interactions); whereas, one-factor-at-a-time design of experiments is restricted to studying one variable while holding all other factors fixed. Through these experiments, not only can we improve our synthetic control, but also gain a fundamental mechanistic insight into the seed mediated synthesis of gold nanoparticles.

Here in, we present a factorial design of experiments of seed-mediated synthesis of gold nanorods simultaneously considering numerous factors including the amount of $NaBH_4$, gold seed particles, ascorbic acid, silver nitrate; the age of the seed solution; the temperature of the synthesis; and many more. The effect of these variables on the longitudinal localized surface plasmon resonance peak position; absolute nanoparticle dimensions, distribution, and morphological impurities; and total Au^0 yield were monitored to determine important design factors in controlling these features of the product gold nanorods.



Coffee and cookies will be served

http://nanohour.beckman.illinois.edu/Nanohour/Nanohour.html