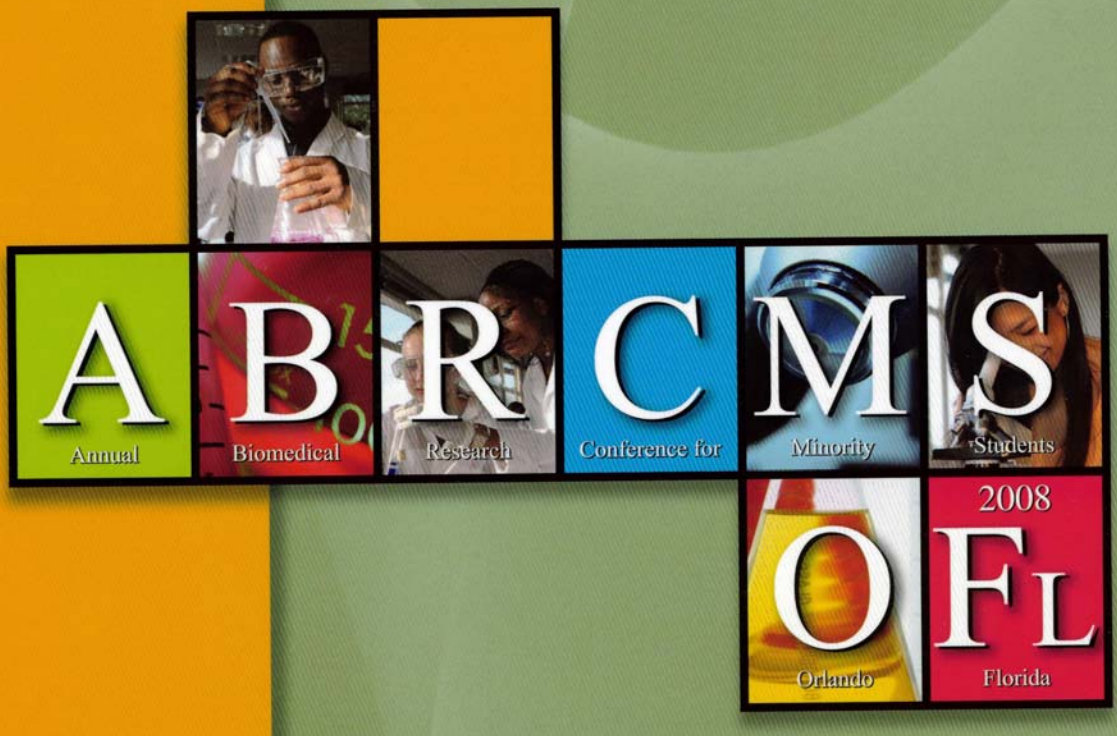
Abstract Book



November 5–8, 2008
Orlando, Florida

A41. Partial Specific Volume Determination of Mixed Surfactants

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Surfactants contain both a polar hydrophilic head group and a hydrophobic carbon tail. They have a wide range of applications from household products to drug delivery systems. Due to their unique properties, mixed surfactants attract a significant amount of attention. This is due to the fact that a change in the composition of surfactant with diverse properties can lead to a wide variation range of applications. In current study, the partial specific volumes of mixed surfactants of sodium undecenyl leucinate (an unsaturated chiral surfactant) and unsaturated sulfated surfactants with varied hydrophobic tail length were determined at different temperatures. The measurements of partial specific volume was made via the density measurements of surfactant solutions using a digital DMA 4500 density meter. Using a graph of weight fraction of the solvent as a function of inverse of density, the partial specific volume of the surfactant can be determined from the value of the *y*-intercept. Partial specific volume values are related to the the structural flexibility of the surfactants. It was observed that the partial specific volume values increased with temperature indicating that the surfactant micelles become more flexible at higher temperatures. In addition, mixed surfactants with different composition were found to have different partial specific volume values. The effect of the head group was also found to play a significant role on the magnitude of partial specific volume.

A43. Preparation of Magnetic Fe3O4 Nanoparticles with Covalently Bound Chitosan and Chitosan Oligosaccharide Lactate for Use in Biomedical Applications

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Functionalized magnetic nanoparticles present characteristics that make them suitable for biomedical applications. When an alternating magnetic field is applied, such particles heat up sufficiently to provoke cancerous cell death without damaging healthy cells. In this project, magnetite (Fe_3O_4) nanoparticles functionalized with covalently bound chitosan were prepared using a new method. Chitosan was used for particle functionalization because it is a biocompatible, positively charged polymer with promising characteristic. It was hypothesized that the separation of the functionalization process into different steps would yield stable, non-agglomerated nanoparticles, suitable for biomedical uses. First, oleic-acid stabilized magnetite nanoparticles (Fe_3O_4 /OA), were synthesized by the thermodecomposition method. The oleic acid originally present on the surface of the particle was replaced via ligand exchange reaction with a silane bearing a carboxylic group (silane-COOH). Subsequently, chitosan (CS) and chitosan oligosaccharide lactate (CSO) were covalently attached to the carboxylic group present on the particle surface via carbodiimide activation, leading to amide linkage formation. The resulting nanoparticles were characterized using Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetric Analysis (TGA), Zeta Potential Measurements, Dynamic Light Scattering (DLS) and Transmission Electron Microscopy (TEM). Infrared spectroscopy results demonstrate successful ligand exchange as well as amide linkage formation. The presence of positively charged amino groups on the particle surface is confirmed by Zeta Potential measurements. TEM images show non agglomerated, stable chitosan coated nanoparticles. The results indicate that the method employed in this project is effective in producing non-agglomerated, positively charged magnetic nanoparticles. Such positively charged particles should have prolonged interactions with negatively charged cell membranes.

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A44. Synthesis of Thiophene Monomers Using the Grignard Reaction

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The relatively recent discovery of conducting polymers gives hope for a strong, flexible, lightweight and cheap alternative to silicon as a semiconductor. Of all conducting polymers, thiophene polymers are among the most widely studied because of their environmental stability and strong conductivity. The profitable characteristics of polythiophene accumulate with variation of the monomers' chemical structure. Affordable and efficient synthesis of thiophene monomers is a step toward making conducting polymers marketable. Our goal is to find an effective and inexpensive method of producing our desired monomers, 2-bithiophene (2-BT, a step in the synthesis of novel monomer) and 3-hexylthiophene (3-HT, a common monomer). We hypothesize that a NiDPPP++ catalyzed cross-coupling method between 3-bromothiophene and Grignard reagents derived from alkyl halides and a NiDPPP++ catalyzed homo-coupling method between 2-bromothiophene and similar Grignard reagents will produce good yields of 3-HT and 2-BT, respectively. The