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Cooperative International Science and Engineering Internships

Cooperative International Science and Engineering Internships(CISEI)
Winter 2007 - Student Projects

Student/School	Mentor	Faculty Sponsor	Department	Student Project
Oscar J. Astudillo University of Chile, Santiago, Chile	Kinson Kam, Crystal Merrill	Anthony Cheetham	MRL	Synthesis, Characterization and Morphological Control of Chiral Frameworks using Carboxylic and Phosphonocarboxylic Acids
Daniel Asenjo Chemistry, University of Chile, Santiago	Richard Elliott	Glenn Fredrickson	MRL	How surfactant architecture affects interfacial surface tension of ternary polymer blends

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Astudillo's Project Page - CISEI Winter 2006

Intern: Oscar J. Astudillo, University of Chile, Santiago, Chile
Mentor: Kinson Kam, Crystal Merrill
Faculty Supervisor: Anthony Cheetham
Department: MRL

Synthesis, Characterization and Morphological Control of Chiral Frameworks using Carboxylic and Phosphonocarboxylic Acids

Nanoporous materials are of great interest mostly because of the properties that they can acquire; they have many applications, such as hydrogen storage, catalysis, ion exchange and gas separations, among others. One of the most important sources of nanoporous materials are the frameworks: synthetic analogues of zeolites. These compounds have the peculiarity of being very versatile, and they are a big source of nanoporous materials. It is possible to manipulate the properties just with the change of the organic component, making them more rigid or more flexible, according to the necessities of the material. In addition, it is possible to manipulate the inorganic part, according to the desired properties. For example, magnesium frameworks are of interest in lightweight materials. On the other hand, interest in the development of nanoscale materials stems from the fact that new properties are acquired at this new length scale. Also, these new properties change with the shape, or size of the nanoparticle. Now, we see in the literature numerous examples of novel nanomaterials, with improved and amazing properties. Also, chiral frameworks are of great interest for his possible applications in non lineal optic properties. So, we are interested in the chiral resolution of racemic phosphonic acids, for the future use of these systems in the synthesis of frameworks. We focus our work into developing a general route to obtaining these compounds, and developing a route to obtaining nanoparticles of these compounds, through the use of colloidal templates.

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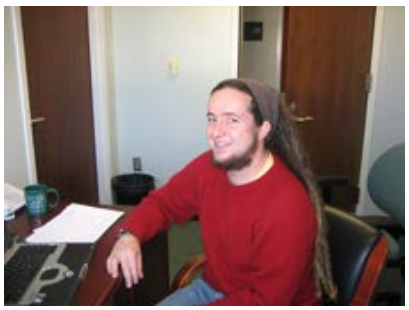
Asenjo's Project Page - CISEI Winter 2006



Intern: Daniel Asenjo, Chemistry, University of Chile, Santiago, Chile
Mentor: Richard Elliott
Faculty Supervisor: Glenn Fredrickson
Department: MRL

How surfactant architecture affects interfacial surface tension of ternary polymer blends

The interfacial activity of a surfactant in a blend of two incompatible homopolymers is investigated theoretically with self-consistent field theory. We consider how the surfactant architecture affects the equilibrium surface thermodynamics of a planar interface, modeling the surfactants as simple diblock or triblock copolymers. We find that longer, symmetric diblocks are the most efficient compatibilizers; their presence results in the greatest reduction of the surface tension at small bulk concentrations. Both copolymer architectures are also more surface-active at longer molecular weights. Additionally, the triblock surfactant, whose middle block loops at the interface, has a similar surface activity to two slightly shorter diblocks. Further work will consider other architectures and the ability of the surfactants to emulsify, forming micellar aggregates in the bulk phases.

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