SYNTHESES IN SOLUTION AND SUPERCritical CO₂, SOLUTION PROPERTIES AND THERMAL CHARACTERISTICS OF POLY(DIALkylPhenyl ACRYLATE)s

Nasrollah Hamidi, Visiting Assistant Professor

- Funding Agency: 1890 Research and Extension
- Funding and Duration: ~$150,000 per year for five year
- Investigators: Nasrollah Hamidi and Ruhullah Massoudi
- Undergraduate Participation: 4 students per academic year and during the summer time are supported during the project
Other Projects

• **RESEARCH-INFUSED STEM AT SOUTH CAROLINA STATE UNIVERSITY** (Since 2002)
  Funded in 2005 and began spring 2006
  Funding Agency: NSF

• **ASTROBIOLOGY** since 2003
  Funding Agency: NASA

• **TRANSPORTATION**
  Funding Agency: UTC (one year project funded ($41000) July 15, 2005, No commenced)

• **A THOROUGH ASSESSMENT OF TOXIC CHEMICALS AND REMEDIATION OF DRINKING GROUNDWATER SOURCES IN RURAL AREAS** (2001-2005)
  Funding Agency: 1890 (~$500,000)
  Ruhullah Massoudi and Nasrollah Hamidi
RESEARCH-INFUSED STEM AT SOUTH CAROLINA STATE UNIVERSITY

• (Since 2002) Dr. D. Smith and …
• Funded in 2005 and began spring 2006
• Funding Agency: NSF

• Calculus: Calculus in Chemistry
• Upgrading (Organic) Chemistry Labs:
  – One UV-Visible
  – Two GC
  – 5 computer with lab simulated programs
• Upgrading General Chemistry Lab:
  – 10 computers with appropriate lab simulation program and hand-on-experiment Data-Acquisitions and processing
ASTROBIOLOGY

- Dr. Cash and Dr. Walter
- Win a trip to A NASA Center
- Undergraduate Student Research Project got 3rd place
- “ASTROBIOLOGY IN CLASSROOM” A manual for teachers
- And …
TRANSPORTATION

Dr. Massoudi

Funding Agency: UTC (one year project funded ($41000) July 15, 2005, Not commenced)
A THOROUGH ASSESSMENT OF TOXIC CHEMICALS AND REMEDIATION OF DRINKING GROUNDWATER SOURCES IN RURAL AREAS

Ruhullah Massoudi and Nasrollah Hamidi

- Four-Year (2001-2005)
- Funding Agency: 1890 (~$500,000)
- GC-MS with purging trap and autosampler
- One peer-reviewed article
- More than a Dozen Posters and presentation
- Two students every semester and summer were evolved
SYNTHESES IN SOLUTION AND SUPERCritical CO$_2$, SOLUTION PROPERTIES AND THERMAL CHARACTERISTICS OF POLY(DIALKYLPHENYL ACRYLATE)S

**Project Goals, Deliverables, or Tasks:**

- **Task 1:** Synthesis and Characterizations of new monomers derivative of poly acrylic acid in regular solvents and super critical fluids
- **Task 2:** Polymerization of the above monomer under conventional conditions and in supercritical carbon dioxide fluid
- **Task 3:** Characterization of the above polymers
Synthesis and characterization of polymeric materials is a new area in the Department of Biological and Physical Sciences. A series of di-alkyl-aromatic esters of acrylic acid, in which the bulkiness of the side chains is systematically varied, are prepared, purified, and characterized. These monomers polymerized in bulk, and we are planning to polymerize in solution and in supercritical carbon dioxide fluid. The polymers will be fractionated and the samples will be characterized in solution by viscometry, size exclusion chromatography, osmometry, and light scattering techniques. The polymers also will be studied in binary solvents. Moreover, the thermal stability of the polymers will be studied by thermogravimetric analysis; and the glass transition temperature will be measured by differential scanning calorimeter. The relationship between the chemical structure of polymers and physical properties will be established.
SYNTHESES IN SOLUTION AND SUPERCritical CO$_2$, SOLUTION PROPERTIES AND THERMAL CHARACTERISTICS OF POLY(DIALKYLPHENYL ACRYLATE)S

What has been done:

Synthesized one new monomer,
Characterized, Polymerized

Out comes:

Two poster presentation
One paper.
Synthesis and Characterization of 3,5-Dimethylphenyl Acrylate

\[
\begin{align*}
\text{HOCCO} & \xrightarrow{\text{ClSOCl}} \text{OCCO} \\
\text{HOCCO} + \text{CH}_3\text{C} = \text{CHCO} & \rightarrow \text{HOCCO} + \text{CH}_3\text{C} = \text{CHC} = \text{CDC}_2
\end{align*}
\]
Synthesis of 3,5-Dimethylphenyl Acrylate
Polymerization
Thermogravimetry Study

- A Mettler-Toledo TGA/SDTA model 851e.
- The polymer begun to decompose at 669 K,
SYNTHESES IN SOLUTION AND SUPERCritical CO₂, SOLUTION PROPERTIES AND THERMAL CHARACTERISTICS OF POLY(DIALKYLPHENYL ACRYLATE)S

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• Also thanks to Dr. Massoudi for letting us using his TGA instrument