School Seminar (2016-2)

School of Materials Science & Engineering

"Functionalized Graphene Sheets–Polymer Based Nanocomposite for Cryotanks"

Dr. Lee, Je Kyun

(Basic Materials & Chemicals R&D, LG Chem.)

2016. 02. 26. (Fri.) 16:00

APRI 1F, Auditorium Hall

※ If you attend this lecture, it will be counted as 'Seminar of SMSE for 2016 Spring Semester' attendance.

Functionalized Graphene Sheets-Polymer Based Nanocomposite for Cryotanks

(우주선 연료 탱크용 Functionalized Graphene 복합 소재 개발)

Dr. Je Kyun Lee

The objective of this project is to develop new lightweight functionalized graphene sheets (FGSs)-polymer nanocomposite based carbon fiber reinforced polymer composite (CFRP) for advanced microcrack-resistant composite cryotanks. The FGSs were successfully synthesized from graphite flakes in large scale by the preparation and thermal exfoliation of graphite oxides. By uniformly dispersing high performance FGSs throughout novel polymer matrix, the new lightweight nanocomposite was fabricated and exhibited drastically enhanced strength and toughness and reduced the polymer resin's coefficients of thermal expansion (CTE). We also found that both FGSs and carbon fiber content played very important roles in determining the mechanical properties and CTE property of the resultant CFRP composite; the optimum FGS content was found to be in the range of 0.1 ~ 0.2 wt% at about 60% CF content. These new nanocomposites based on CFRP composites significantly improved tensile and 3-point bending fracture toughness at room and cryogenic temperatures, increased T_g, and reduced the CTEs at both below and above T_g. These enhanced mechanical and CTE properties may occur due to excellent intrinsic properties, higher surface area, homogeneous dispersion, the confinement of polymer chains, and the reduction of chain mobility by the percolated wrinkled structure of the embedded FGS nanoparticles.

Je Kyun Lee, Ph.D.

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PROFESSIONAL EXPERIENCE

LG Chem, Basic Materials & Chemicals R&D, Taejeon Science Town, Korea Sept. 2013-Present
Research Fellow

Agiltron, Inc., (Division: Nanotrons, Corp.), Woburn, MA, USA Feb. 2009-Jul. 2013
Senior Scientist & Principal Investigator

Aspen Aerogels, Inc., Northborough, MA, USA Feb. 2001- Jan. 2009
Senior Research Leader (Feb. 2001-Jan. 2007), Principal Scientist (Feb. 2007-Jan. 2009) & Principal Investigator

LG Chemical (largest chemical company in Korea), Taejeon Science Town, Korea 1985-1994
Researcher (Mar.1985-Dec.1989), Senior Scientist & Project Leader (Jan.1990-Aug.1994)

EDUCATION AND ACADEMIC EXPERIENCE

MIT, Cambridge, Massachusetts, Department of Material Science & Engineering **Mar. 1999-Feb. 2001**
Postdoctoral Associate

- Research Projects: Rheology and Thermoforming of ABS Polymers and Low Permeable Synthesis of Epoxide-Liquid Crystal Polymer and Their Nanocomposite Barrier Coating.

The University of Akron, Akron, Ohio, **Ph.D.** in **Polymer Engineering** **Aug.1994- Feb. 1999**

- Research Projects: 1) Morphology Evolution of Polymer Blends During Compounding
  2) Mechanical Properties, Rheology, and Processing of Metallocene-Catalyzed Polyolefins

Han Yang University, Seoul, Korea **1985**
M. S., Industrial Chemistry, Engineering College

Han Yang University, Seoul, Korea **1983**