

Curriculum Vitae

SEUNGHWA YANG, Ph.D.

Post Doctoral Research Associate
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▣ EDUCATION

- 2011.02 Ph.D School of Mechanical and Aerospace Engineering, **Seoul National University**, Seoul, Korea
Title of Dissertation : A study on the development of sequential multiscale bridging method for
nanocomposites considering the size effect of nanoparticle
Supervisor : Prof. Maenghyo Cho
Dissertation committee: Prof. Hyo-Chol Sin, Prof. Maenghyo Cho, Prof. Yoon Young Kim, Prof.
Byeng Dong Youn, Prof. Heung-Jae Chun
- 2006.08 M.S. School of Mechanical and Aerospace Engineering, **Seoul National University**, Seoul, Korea
- 2003.08 B.S. School of Mechanical Engineering, **Chung-Ang University**, Seoul, Korea

▣ PROFESSIONAL EXPERIENCE

- 2012.09- Appointed as a Postdoctoral Research Associate,
Mechanical and Aerospace Engineering Department, **UCLA**
Supervisor: Prof. H. Thomas Hahn
- 2011.03-Present WCU (World Class University) project Postdoctoral Research Associate
School of Mechanical and Aerospace Engineering, **Seoul National University**.
Supervisor : Prof. Maenghyo Cho
- 2004.09-2011.02 Research Assistant
School of Mechanical and Aerospace Engineering, **Seoul National University**.
- Major Research Projects in the Smart Structures & Design Laboratory
 - Development of nano-continuum bridging technology for microscopic structure design as a National Research Laboratory Program (2007~2011), **Team leader**.
 - Multiscale fusion mechanical system design as a World Class University Project (2009-

2011), **Team leader**.

-Development of nano-continuum multiscale analysis technology, funded by Hyundai-Kia Motor company (2010~2011), **Team leader, Lecturer** of one-day multiscale analysis tutorial course.

- Involved in more than 3 research projects funded by the National Research Foundation of Korea from 2004 to 2007.

■ OTHER EXPERIENCE

2004.01-2004.08 Daewoo E&C Co. Ltd, Industrial petrochemical technology team.

1998.10-2001.01 Military Service (discharged as Petty officer 2nd class of R.O.K Navy).

■ RESEARCH INTERESTS

My major research fields are multiscale modeling of multifunctional nanocomposites, molecular dynamics study of polymer-based materials, micromechanics of heterogeneous structures, and multifunctional durability of flexible electronics. In multiscale modeling of nanocomposites, efficient sequential multiscale bridging methods for various properties including elastic, thermoelastic, thermal transport, and elastoplastic behavior of polymer nanocomposites have been developed till now via molecular dynamics simulations, continuum micromechanics, and finite element-based homogenization method. Some published results mainly focused on the reinforcing filler size effect on overall properties of nanocomposites. Besides, atomistic studies on interface and adhesion related problems in fusion mechanical system design are within my major research focus. Regarding this, I have published one paper on characterization of nanoimprint lithography.

My recent research topics on the nanocomposites are the molecular modeling of elastomer and elastomeric nanocomposites, surface functionalization (covalent grafting) of nano fillers and their multiscale modeling, cross-linked epoxy-based nanocomposites, tuning of thermal transport properties of polymer-based materials via mechanical strain, defects of nanotubes and graphene embedded into a polymer matrix, and weakened interface problems. As the interfacial characteristics are very important factor that can critically affect the performance of nanocomposites, molecular level simulations on the interaction between pristine, surface treated and defected nanotubes and surrounding polymer are of my major concern.

In most of my research fields, molecular level simulations are preferred to identify extraordinary behavior of nanocomposites and to understand the theoretical background of the mechanical behavior of polymeric materials. Based on the observation from the molecular level simulations, efficient continuum-based constitutive models are adopted and modified to describe the physical behavior of nanocomposites with accuracy. One future extension of the multiscale modeling scheme is the design of ultra performance material inspired from the 'Spider silk', which resembles the nanoclay reinforced polymer composites in its microstructure.

My near future research topic is the multifunctional durability problem of flexible electronics such as printed circuits, flexible batteries, solar modules, capacitors etc. For a reliable design of flexible electronics, both experimental and analytical approaches are essential, however, most of the researches on this fields have been biased to the electrical performance so far. Regarding this research, I'll manage an international collaboration to draw fruitful outcomes to industrialize the research outputs and to make a breakthrough in ecofriendly design of fusion mechanical systems. As a first step in this field, I'm interested in multifunctional integration of energy modules such as solar cell and flexible battery to the load bearing light weight structures. For this research, I'm appointed as a pos-doc research associate in Prof. H.Thomas Hahn's group at UCLA from 15th Sep, 2012. Funding source of this research is the US Air Force Office of Scientific Research(AFOSR). In this research, both experimental and analytical exploration of a long time fatigue tests to correlate the multifunctional failure of energy modules with the mechanical failure of load bearing structure, and various joining method to integrate energy modules are major tasks. Further extension to the printed electrodes and batteries will be expected to be successful after completing this research project.

■ TEACHING INTERESTS

1. Solid Mechanics
2. Statics & Dynamics
3. Mechanical behavior of materials and computer simulation
4. Finite element analysis
5. Micromechanics
6. Molecular modeling and simulation (plan to open when I'm appointed)
7. Introduction to nano-continuum bridging technology (plan to open when I'm appointed)

■ HONORS AND AWARDS

1. Best Presentation Award, Annual Conference of COSEIK (Computational Structural Engineering Institute of Korea), 2010
2. Best Presentation Award for Ph.D thesis, Seoul National University, 2011

■ REFEREE SERVICE

Journal of Composites Materials (SAGE PUB)

Journal of Mechanical Science and Technology (Springer)

Advances in Materials Science and Engineering (Hindawi Publishing Corporation)

■ ACADEMIC ACTIVITY

The 18th International Conference on Composites Materials (ICCM 18) 2011, 08, Jeju, Korea

-Session Chair : Multi-scale Modeling/Multiscale Modeling of Composites

■ PROFESSIONAL MEMBERSHIP

Computational Structural Engineering Institute of Korea (COSEIK),
Korea Society of Mechanical Engineering (KSME),
Korea Society of Composites Material (KSCM)
The Korean Society for Aeronautical & Space Sciences (KSAS),
American Institute of Aeronautics and Astronautics (former student member).

■ SCIENTIFIC PROGRAMS PROFICIENT

1. Molecular dynamics simulation: Material Studio (Commercial package), LAMMPS (Open source code)
2. Micromechanics : Own Matlab code for Mori-Tanaka, self-consistent, multi inclusion model, aligned and randomly oriented ellipsoidal inclusion problem in isotropic and anisotropic media, elastic, elastoplastic, thermoelastic, thermal conductivity problem with Kapitza thermal resistance.
3. Finite element: ABAQUS, NASTRAN, Own computer code development is available.

■ REFERRED JOURNAL PAPERS

(Published: 9 Accepted: 2 In revision: 1 Under review: 2)

1. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, " Influence of Thrower-Stone-Wales defects on the interface properties of carbon nanotube reinforced polypropylene composites by molecular dynamics approach", **Carbon**, under review, 2012 (*IF: 5.378*)
2. Hyunseong Shin, **Seunghwa Yang**, Seongmin Chang, Suyoung Yu, Maenghyo Cho, "Multiscale homogenization modeling for thermal transport properties of polymer nanocomposites with Kapitza thermal resistance", **Polymer**, under review, 2012 (*IF: 3.828*)
3. **Seunghwa Yang**, Joonmyung Choi, Maenghyo Cho, "Elastic stiffness and filler size effect of covalently grafted nanosilica polyimide composites: Molecular dynamics study", **ACS Applied Materials and Interfaces**, Accepted, 2012 (*IF: 4.525*)
4. **Seunghwa Yang**, Suyoung Yu, Junghyun Ryu, Jeong-Min Cho, Woomin Kyoung, Do-Suck Han, Maenghyo Cho, "Nonlinear multiscale modeling approach to characterize elastoplastic behavior of CNT/polymer nanocomposites considering the interphase and interfacial imperfection", **International Journal of Plasticity**, In revision, 2012 (*IF: 4.603*)
5. Joonmyung Choi, **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, "Method of scale-bridging for thermoelasticity of cross-linked epoxy/SiC nanocomposites at a wide range of temperatures", **Polymer**, Accepted, 2012 (*IF: 3.828*)
6. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, "Multiscale modeling of size-dependent elastic properties of carbon nanotube/polymer nanocomposites with interfacial imperfections", **Polymer**, Vol.24(2), 623-633, 2012.01 (*IF: 3.828*)

7. Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho, "Multiscale modeling of cross-linked epoxy nanocomposites to characterize the effect of particle size on thermal conductivity", **Journal of Applied Physics**, Vol.110, 124302, AIP, 2011.12 (*IF: 2.079*)
8. Joonmyung Choi, Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho, "The glass transition and thermoelastic behavior of epoxy-based nanocomposites: a molecular dynamics study", **Polymer**, Vol.52, 5197-5203, 2011.10 (*IF: 3.828*)
9. Maenghyo Cho, **Seunghwa Yang**, Seongmin Chang, Suyoung Yu, "A study on the prediction of the mechanical properties of nanoparticulate composites using the homogenization method with the effective interface concept", **International Journal for Numerical Methods in Engineering**, Vol.85(12), 1564-1583, 2011.03. (*IF: 2.025*)
10. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, "Sequential thermoelastic multiscale analysis of nanoparticulate composites ", **Journal of Applied Physics**, Vol. 108, 056102, AIP, 2010.09. (*IF: 2.079*)
11. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, "Molecular Dynamics Study to Identify Mold Geometry Effect on the Pattern Transfer in Thermal Nanoimprint Lithography ", **Japanese Journal of Applied Physics**, Vol. 48, 06FH03, IPAP, 2009.06. (*IF: 1.309*)
12. **Seunghwa Yang**, Maenghyo Cho, " A scale-bridging method for nanoparticulate polymer nanocomposites and their non-dilute concentration effect ", **Applied Physics Letters**, AIP, Vol. 94,223104, also featured in **Virtual Journal of Nano Sci & Tech**, Vol. 19, Issue 24, **Virtual Journal of Bio Phys Research**, Vol. 17, Issue 12, 2009.06. (*IF: 3.726*)
13. Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho, "Multi-scale modeling of cross-linked epoxy nanocomposites ", **Polymer**, Vol. 50, pp. 945-952, Elsevier, 2009.01 (*IF: 3.065*)
14. **Seunghwa Yang**, Maenghyo Cho, "Scale bridging method to characterize mechanical properties of nanoparticle/polymer nanocomposites ", **Applied Physics Letters**, Vol. 93, Issue 4, 043111, AIP, 2008.07 (*IF: 3.596*)

■ INTERNATIONAL CONFERENCE PROCEEDINGS

1. Joonmyung Choi, **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, " Multiscale model for polymer-based nanocomposites considering phase transition behavior ", 53rd Structures, Structural Dynamics, and Materials and Co-located Conferences (53rd SDM), AIAA, 2012.04, Honolulu, HI, USA.
2. **Seunghwa Yang**, Junghyun Ryu, Suyoung Yu, Maenghyo Cho, "Hydrostatic Pressure Effect and Elastoplastic Behavior of Nanoparticulate Polymer Composites : Molecular Dynamics and Continuum Approach," International Conference on Advances in Interaction and Multiscale Mechanics (AIMM'11), Seoul, Korea
3. Suyoung Yu, **Seunghwa Yang**, Joonmyung Choi, Maenghyo Cho "Characteristics of the Hygrothermal Properties of Polymeric Nanocomposites using Atomistic Simulation," International Conference on Advances in Interaction and Multiscale Mechanics (AIMM'11), Seoul, Korea

4. **Seunghwa Yang**, Joonmyung Choi, Suyoung Yu, Maenghyo Cho “Multiscale modeling of covalently grafted nanoparticle/polymer nanocomposites,” 18th International Conference on Composites Materials (ICCM 18), Jeju, Korea
5. Joonmyung Choi, Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho “The thermoelastic behavior of polymeric based nanocomposites in glassy and rubbery states, 18th International Conference on Composites Materials (ICCM 18), Jeju, Korea
6. Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho “Multiscale analysis of thermal conductivity for particulated nanocomposites, 18th International Conference on Composites Materials (ICCM 18), Jeju, Korea
7. Seongmin Chang, **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, "Multiscale homogenization method to predict filler size-dependent thermoelastic properties of polymer nanocomposites", The 18th International Conference on Composites Materials, 2011.08, Jeju, Korea.
8. Maenghyo Cho, **Seunghwa Yang**, Suyoung Yu, Junghyun Ryu “Multiscale nonlinear thermomechanical behavior of nanocomposites”, 11th US National Congress on Computational Mechanics (USNCCM), 2011.07, Mineapolis, MINNESOTA, USA.
9. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, Woomin Kyoung, Jeongmin Cho “Multiscale modeling of size dependent elastic properties of CNT/polymer nanocomposites with interfacial imperfections”, 11th US National Congress on Computational Mechanics (USNCCM), 2011.07, Mineapolis, MINNESOTA, USA.
10. Maenghyo Cho, Suyoung Yu, **Seunghwa Yang**, “Thermal transport properties of nanoparticulate composites under mechanical loading”, 52th AIAA/ASME/ASCE/AHS/ASC SDM Conference, AIAA, 2011.04, Denver, USA
11. Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho, " Investigation of Thermal Conductivity of Epoxy/SiC Nanocomposites Considering Kapitza Resistance by Molecular Dynamics ", 9th World Congress on Computational Mechanics and 4th Asian Pacific Congress on Computational Mechanics (WCCM/APCOM 2010), 2010.07, Sydney, Australia.
12. **Seunghwa Yang**, Junghyun Ryu, Suyoung Yu, Maenghyo Cho, " Atomistic and Continuum Modeling of the Elastoplastic Behavior of Polymeric Nanomaterials ", 9th World Congress on Computational Mechanics and 4th Asian Pacific Congress on Computational Mechanics (WCCM/APCOM 2010), 2010.07, Sydney, Australia.
13. Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho, " Molecular dynamics and continuum approach to characteristics verification of different sized CNT reinforced nanocomposites ", KSME-JSME Joint Symposium 2010 on Computational Mechanics and Computer-Aided Engineering, KSME, 2010.03, Seoul.
14. **Seunghwa Yang**, Suyoung Yu, Maenghyo, " Efficient Sequential Scale Bridging Method for the thermoelastic properties of nanoparticulate polymer nanocomposites ", KSME-JSME Joint Symposium 2010 on Computational Mechanics and CAE, KSME, 2010.03, Seoul, Korea.
15. Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho, " Size effects on thermal conductivity of SiC/epoxy nanocomposites using NEMD method ", Joint International Symposia on 3rd Micro & Nano Technology and Micro/Nanoscale Energy Conversion, 2010.03, Seoul.
16. Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho, " Molecular Dynamics Analysis for Multi-functional Nanocomposites ", International conference on computational design in engineering (CODE2009), Computational Structural Engineering Institute of, 2009.11.

17. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, " Elastoplastic behavior of nanoparticle polymer nanocomposites: Molecular dynamics study ", International conference on computational design in engineering (CODE2009), COSEIK, 2009.11, Seoul, Korea.
18. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, " Thermoelastic properties and scale bridging method of nanoparticulate composites ", 10th US National Congress on Computational Mechanics (USNCCM), 2009.07, Columbus, OHIO, USA.
19. Suyoung Yu, **Seunghwa Yang**, Seongmin Jang and Maenghyo Cho, " Nanocomposites Analysis Considering Continuum Homogenization and Atomistic Modeling ", 10th US National Congress on Computational Mechanics (USNCCM), 2009.07, Columbus, OHIO, USA..
20. Maenghyo Cho, Suyoung Yu, **Seunghwa Yang**, Seongmin Chang, " Multiscale analysis of particulate nanocomposites-thermomechanical properties ", 17th International Conference on Composite Materials (ICCM17), 2009.07, Edinburgh, UK.
21. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, " Molecular dynamics study to identify mold geometry effect on the pattern transfer of thermal NIL process ", MNC 2008, 2008.10, Fukuoka, Japan.
22. Maenghyo Cho, **Seunghwa Yang**, Jinbok Choi, " Development of sequential multi-scale analysis for nano structured materials ", MMM 2008, 2008.10, Florida, USA.
23. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, " Multi-scale analysis of nanoparticle reinforced composites : Scale bridging method for non-dilute concentration ", 9th World Congress on Computational Mechanics (WCCM2008), 2008.07, Venice, Italy.
24. Suyoung Yu, **Seunghwa Yang**, Maenghyo Cho, " Simulation of Nano-particulate Epoxy Composites Considering Cross-links ", 9th World Congress on Computational Mechanics (WCCM2008), 2008.07, Venice, Italy.
25. **Seunghwa Yang**, Maenghyo Cho, " Multi-scale analysis to characterize mechanical properties of nanoparticle/polymer composites ", 49th AIAA/ASME/ASCE/AHS/ASC SDM Conference, AIAA, 2008.04, Illinois, USA
26. Maenghyo Cho, **Seunghwa Yang**, Suyoung Yu, " Molecular dynamics study to identify mold geometry effect on the pattern transfer of thermal NIL process ", ASNIL 2008, 2008.04, Seoul, Korea.
27. **Seunghwa Yang**, Suyoung Yu, Maenghyo Cho, " Multi-scale analysis of silica nanoparticle composites ", APCOM'07, 2007.12, Kyoto, Japan.
28. Maenghyo Cho, **Seunghwa Yang**, Suyoung Yu, " Influence of stamp and substrate materials on nanoimprint process : MD simulation approach ", ISNMM2007, 2007.12, Seoul, Korea.
29. Maenghyo Cho, **Seunghwa Yang**, " Atomistic simulations for thermal and mechanical properties of CNT/polymer nanocomposites ", 48th AIAA/ASME/ASCE/AHS/ASC SDM Conference, AIAA, 2007.04, Hawaii, USA.

▣ OTHER PAPERS AND CONFERENCES

3 domestic journal papers (Listed journals by National Research Foundation of Korea) and 26 domestic conference proceedings (in Korean).

▣ RESEARCH PROJECTS FULFILLED (From 2007)

2008.12 - Present : Multiscale design of fusion mechanical systems, World Class University (WCU) project, **Research Associate**, PI: Prof. Maenghyo Cho.

2010.12 – Present: Multi-scale approach for nanocarbon-based composites' electro/thermo-conductive behaviors, Collaboration with KIST, **Research Associate**, PI: Prof. Woo Ill Lee.

2007. 7 - 2012. 6 : Development of nano-continuum bridging technology for microscopic structure design, National Research Lab (NRL) project, **Research Associate**, PI: Prof. Maenghyo Cho.

2010. 11 - 2011. 10 : Development of multiscale analysis technology for non-linear behavior of CNT composites, Industrial collaboration with Hyundai-Kia motor company, **Research Associate**, PI: Prof. Maenghyo Cho.

2009. 11 - 2010. 7 : Development of nano-continuum multiscale analysis technology, Industrial collaboration with Hyundai-Kia motor company, **Research Associate**, PI: Prof. Maenghyo Cho.

Involved in more than 3 research projects funded by the National Research Foundation from 2004 to 2007

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