BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE
Eric A. Grulke	Professor, Chemical & Materials Engineering Associate Dean for Research, College of Engineering
eRA COMMONS USER NAME (credential, e.g., agency login) ERIC.GRULKE	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
The Ohio State University	B.ChE.	1971	Chemical Engineering
The Ohio State University	M.S.	1972	Chemical Engineering
The Ohio State University	Ph.D.	1975	Chemical Engineering

A. Personal Statement

Small manufacturing firms don't have the time, training or expertise to navigate all the product and process compliance issues raised by recent regulatory standards related to environmental, health and safety (EHS) issues. DoD now has directives in place that lead naturally toward integration of EHS issues into sustainable products and processes. The goal of research project 2 is to develop integrated testing strategies are needed for assessing toxicity endpoints for materials such as common water-based solvents and household cleaning agents. Dr. Grulke is the Safety Office for the College of Engineering, and has been teaching an undergraduate course in professionalism, ethics and safety since 2004. Over the last several years, Dr. Grulke has been collaborating on environmental health and safety issues associated with nanoparticles (nanoEHS) with a multidisciplinary team involving Pharmacy, Chemistry, Neurobiology and Engineering. His contributions to this study of the toxicity of nanoceria to the blood-brain barrier are: characterization of nanoparticles as received and in aqueous dispersions for injection, as well as synthesis of size-controlled nanoparticles for probing their transport across specific biological structures.

B. Positions and Honors

1975-78 Senior R&D Engineer, B.F. Goodrich Chemical Division, Brecksville, Ohio.

1978-93 Professor, Associate Professor (81-87), Assistant Professor (78-81) Department of Chemical Engineering, Michigan State University. Adjunct; Food Science, Agricultural Engineering.

1981-2 Congressional Engineering Fellow with Senator Carl Levin, Michigan.

1987-90 Acting Associate Dean, College of Engineering, Michigan State University.

1993-2001 Chairman, Department of Chemical & Materials Engineering, University of Kentucky. Director, Materials Characterization Center, Associate Director, Carbon Materials Group. CAER.

1993-present Professor, Department of Chemical and Materials Engineering, University of Kentucky

2000-03 Director, Advanced Carbon Materials Center, NSF MRSEC, University of Kentucky

2003-present Associate Dean of Research and Graduate Studies, Director, Electron Microscope Center, College of Engineering, University of Kentucky

<u>Editorial Boards</u>
Senior U.S. Editor, Polymer Handbook

<u>Memberships</u>
American Institute of Chemical Engineering, American Society of Engineering Educators, Materials Reseach Society, American Chemical Society, Society for Plastics Engineers

C. Selected Peer-reviewed Publications (selected from over 130 refereed articles)
Five most relevant publications to the current application
1-5

1. Wu, P.; Grulke, E. A.; Graham, U. M.; Tseng, M. T.; Sultana, R.; Hardas, S. S.; Butterfield, D. A.; Dan, M.; Florence, R. L.; Yokel, R. A. In *Synthesis, characterization and modification of cerium oxide nanomaterials for toxicological evaluation*, American Chemical Society: 2010; pp INOR-887.
2. Yokel, R. A.; Florence, R. L.; Unrine, J. M.; Tseng, M. T.; Graham, U. M.; Sultana, R.; Butterfield, D. A.; Wu, P.; Grulke, E., Biodistribution and toxicity of systemically-introduced ceria engineered nanomaterial. *Abstracts of Papers, 237th ACS National Meeting, Salt Lake City, UT, United States, March 22-26, 2009* **2009**, ENVR-127.
3. Mandzy, N. S.; Grulke, E. A.; Druffel, T. L. Methods of making and using metal oxide nanoparticles. 2006-US45320. 2008020867, 20061121., 2008.
4. Druffel, T.; Mandzy, N.; Sunkara, M.; Grulke, E., Polymer nanocomposite thin film mirror for the infrared region. *Small* **2008,** *4* (4), 459-461.
5. Dey, S.; Bakthavatchalu, V.; Tseng, M. T.; Wu, P.; Florence, R. L.; Grulke, E. A.; Yokel, R. A.; Dhar, S. K.; Yang, H.-S.; Chen, Y.; St. Clair, D. K., Interactions between SIRT1 and AP-1 reveal a mechanistic insight into the growth promoting properties of alumina (Al2O3) nanoparticles in mouse skin epithelial cells. *Carcinogenesis* **2008,** *29* (10), 1920-1929.

Additional ten publications of important to the field (in chronological order)
6-15

6. Harrison, C.; Weaver, S.; Bertelsen, C.; Burgett, E.; Hertel, N.; Grulke, E., Polyethylene/boron nitride composites for space radiation shielding. *Journal of Applied Polymer Science* **2008,** *109* (4), 2529-2538.
7. Druffel, T.; Buazza, O.; Lattis, M.; Farmer, S.; Spencer, M.; Mandzy, N.; Grulke, E. A., The role of nanoparticles in visible transparent nanocomposites. *Proc. SPIE* **2008,** *7030* (Nanophotonic Materials V), 70300F/1-70300F/9.
8. Yang, Y.; Grulke, E. A.; Zhang, Z. G.; Wu, G., Temperature effects on the rheological properties of carbon nanotube-in-oil dispersions. *Colloids and Surfaces, A: Physicochemical and Engineering Aspects* **2007,** *298* (3), 216-224.
9. Yang, Y.; Grulke, E. A.; Zhang, Z. G.; Wu, G., Thermal and rheological properties of carbon nanotube-in-oil dispersions. *Journal of Applied Physics* **2006,** *99* (11), 114307/1-114307/8.
10. Fry, D.; Langhorst, B.; Wang, H.; Becker, M. L.; Bauer, B. J.; Grulke, E. A.; Hobbie, E. K., Rheo-optical studies of carbon nanotube suspensions. *Journal of Chemical Physics* **2006,** *124* (5), 054703/1-054703/9.
11. Druffel, T.; Geng, K.; Grulke, E., Mechanical comparison of a polymer nanocomposite to a ceramic thin-film anti-reflective filter. *Nanotechnology* **2006,** *17* (14), 3584-3590.
12. Yang, Y.; Zhang, Z. G.; Grulke, E. A.; Anderson, W. B.; Wu, G., Heat transfer properties of nanoparticle-in-fluid dispersions (nanofluids) in laminar flow. *International Journal of Heat and Mass Transfer* **2005,** *48* (6), 1107-1116.
13. Yang, Y.; Grulke, E. A.; Zhang, Z. G.; Wu, G., Rheological behavior of carbon nanotube and graphite nanoparticle dispersions. *Journal of Nanoscience and Nanotechnology* **2005,** *5* (4), 571-579.
14. Mandzy, N.; Grulke, E.; Druffel, T., Breakage of TiO2 agglomerates in electrostatically stabilized aqueous dispersions. *Powder Technology* **2005,** *160* (2), 121-126.
15. Hilding, J.; Grulke, E. A.; Zhang, Z. G.; Lockwood, F., Dispersion of carbon nanotubes in liquids. *Journal of Dispersion Science and Technology* **2003,** *24* (1), 1-41.

C. Research Support
Ongoing research support

RFQ-RT-09-00069 Grulke (PI) 9/1/09 - 12/31/10 Environmental Protection Agency

High resolution microscopy characterization of nanomaterial samples

This project will provide Level I screening of eight nanomaterials samples and Level II analysis for four samples. The materials to be studied are associated with health study effects of nanoparticles.

Grulke (PI) 1/1/2010-6/30/2010
Vision Dynamics, LLC

Scale-up of nanocomposite production. (subcontract on DOE STTR Phase I).

The overall goal of this project is to transfer nanocomposite scale-up technology for optical device applications to a small business for commercialization. NanoClear®, one of the products resulting from this research, received a Nano50 award from Nanotech Briefs in 2006

Grulke (co-PI) 4/1/08 – 3/31/12
EPA Star award; Safety/toxicity of ceria (a model engineered nanoparticle) to the brain; R. Yokel, PI
Scope project: **synthesis and characterization of ceria nanoparticles**; E. Grulke, co-PI
The overall goal of this project is to characterize ceria nanoparticles for *in vivo* toxicology testing (blood-brain barrier) by a multidisciplinary team.

Grulke (PI) 8/1/08 – 7/31/10 Vision Dynamics, LLC
Nanoparticle Dispersions for Plastic Lens Coatings
The overall goal of this project is to develop nanoparticle composites with high and low refractive indices for optical lens applications. UK has subcontracts from VDL, which is supported by two Phase I and Phase II SBIR contracts from NSF. New optical lens products have been launched via this research.

Grulke (PI) 9/30/07-3/31/11 DOE EPSCoR
Nanoscale materials and architectures for energy conversion
This project involves a research team (University of Louisville plus University of Kentucky) developing novel materials and architectures for energy conversion. As administrative PI, Grulke coordinates the work of this project.

Grulke (PI) pending NSWC Crane
Basic Ordering Agreement (BOA) for Basic Science and/or Engineering Research and Development
This project structures a BOA between the College of Engineering and Crane Naval Surface Warfare Center for new engineering research and development projects. The College of Engineering has research capabilities in 12 of the 14 research areas required by Crane.

Completed research support

PR-NC-08-10414 Grulke (PI) 5/1/08 – 2/28/09 Environmental Protection Agency
Physical and chemical analyses of titania and ceria nanoparticles employed in health effects research studies.
This contract provided physical and chemical analyses (elemental analysis, surface area and porosity, primary particle and aggregate size, crystal structure, organic carbon content, and particle shape and morphology) for 20 commercial nanoparticle samples.

Grulke, PI 11/1/06 – 9/30/09 TARDEC Petroleum, Oil and Lubricants Division (subcontract from Valvoline)
Nanofluid technology for military petroleum, oil and lubricant (POL) products
This project developed and characterized nanoparticle/dispersant systems of nanoparticle fluids for military applications. The nanofluids provided improved energy transfer in critical vehicle systems.

Synergistic activities

- Senior U.S. editor, *Polymer Handbook*, John Wiley.
- ABET evaluator, 2000- 2009, Chemical Engineering
- Member, ISO/TC229, ANSI-accredited U.S. Technical Advisory Group for ISO/TC229, developing ISO standards for the emerging nanotechnology industry, 2010