

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering
Department of Materials Science and Engineering

Approved by the
Regents
May 21, 2015

Katsuyo S. Thornton, associate professor of materials science and engineering, with tenure, Department of Materials Science and Engineering, College of Engineering, is recommended for promotion to professor of materials science and engineering, with tenure, Department of Materials Science and Engineering, College of Engineering.

Academic Degrees:

Ph.D. 1997 University of Chicago, Astronomy and Astrophysics, Chicago, IL
M.S. 1993 University of Chicago Astronomy and Astrophysics, Chicago, IL
B.S. 1991 Iowa State University, Physics, Ames, IA

Professional Record:

2010 – present Associate Professor (with tenure), Department of Materials Science and Engineering, University of Michigan
2004 - 2010 Assistant Professor, Department of Materials Science and Engineering, University of Michigan
2001 - 2004 Research Assistant Professor, Department of Materials Science and Engineering, Northwestern University
2001 Visiting Lecturer, Department of Materials Science and Engineering, Massachusetts Institute of Technology
1999 - 2000 Visiting Scientist, Department of Materials Science and Engineering, Massachusetts Institute of Technology
1997 - 2001 Post-doctoral Fellow, Department of Materials Science and Engineering, Northwestern University

Summary of Evaluation:

Teaching: Professor Thornton's record in teaching has been strong in every respect including mentoring students, teaching courses, and developing curricula. Her teaching evaluations in both undergraduate and graduate courses are good. It is admirable that she has included a large number of undergraduates in her research. A major component of her teaching record includes development of curricula that have been adopted both at the University of Michigan and at universities nationwide. The graduate course on modeling and simulation in Materials Science and Engineering that she developed has been well received. In addition, Professor Thornton has introduced computational materials modules to undergraduate laboratory courses and has assisted others in incorporating modeling into their classes. She has also played a major national role in curricula development and training via the Integrated Computational Materials Education summer school to "educate the educators." She has graduated five Ph.D. students as chair or co-chair and is currently chairing or co-chairing ten Ph.D. candidates committees. In addition, she has served as the advisor or co-advisor to three masters students.

Research: Professor Thornton's research performance has been excellent. She has established a highly visible portfolio of funded research and has assembled a group of highly qualified graduate students, postdocs and research scientists. In addition to her substantial and high impact independent research, she has established productive collaborations both internal to the University of Michigan and externally with leading researchers in her field, which has increased the impact and visibility of her research program. Her application of computational methods has been frequently referred to as pioneering research, whether

it is in the application of phase field to problems in energy materials, soft matter or metals, or in the development of new computational methods such as the extended smooth boundary method, or important improvements in the phase field crystal method. She has secured a very impressive level of funding from very competitive agencies such as NSF and the Department of Energy. Professor Thornton's scholarly productivity is excellent and has greatly accelerated over the past six years. She has published over 60 refereed publications, in high profile journals and has been cited over 1700 times with an h-index of 20 (Web of Science). She has established a strong international reputation as a leading researcher in computational materials science.

Recent and Significant Publications:

- B. Orvananos, R. Malik, H.-C. Yu, A. Abdellahi, C. P. Grey, G. Ceder and K. Thornton, "Architecture Dependence on the Dynamics of Nano-LiFePO₄ Electrodes," *Electrochimica Acta* 137, 245-247 (2014).
- J.L Fife, J.W. Gibbs, E.B. Gulsoy, C.-L. Park, K. Thornton, P.W. Voorhees, "The Dynamics of Interfaces During Coarsening in Solid-Liquid Systems." *Acta Materialia*, 70, 66-78 (2014).
- C.M. Funkhouser, M. Mayer, F. J. Solis, and K. Thornton, "Effects of Interleaflet Coupling on the Morphologies of Multicomponent Lipid Bilayer Membranes." *Journal of Chemical Physics*, 138, 024909-1 (2013).
- H.-C. Yu, H.-Y. Chen, and K. Thornton, "Extended Smoothed Boundary Method for Solving Partial Differential Equations with General Boundary Conditions on Complex Boundaries." *Modelling and Simulation in Materials Science and Engineering*, 20, 075008 (2012).
- D.-H. Yeon, Z.-F. Huang, K.R. Elder, and K. Thornton, "Density-Amplitude Formulation of the Phase-Field-Crystal Model for Two-Phase Coexistence in Two and Three Dimensions." *Philosophical Magazine*, 90, 237 - 263 (2010).
- J.R. Wilson, W. Kobsiriphat, R. Mendoza, H.-Y. Chen, J.M. Hiller, D.J. Miller, K. Thornton, P.W. Voorhees, S.B. Adler, and S.A. Barnett, "Three-Dimensional Reconstruction of a Solid-Oxide Fuel-Cell Anode." *Nature Materials*, 5, 541-544 (2006).

Service: Professor Thornton has established a solid record of service particularly at the national and departmental level. At the departmental level, her service has been substantial, having chaired the undergraduate committee and served on a variety of other standing and ad hoc committees including the graduate committee. At the university level, her service has also been substantial, including three years on the Rackham Merit Fellows selection committee, three years on UMOR's Advanced Research Computing Advisory Team, and four years as the Materials Science and Engineering representative on the International Programs Committee. Her service at the national level is particularly impressive. She has led the development of a new area for The Mineral, Metals and Materials Society (TMS) serving as the inaugural chair of the Integrated Computational Materials Engineering (ICME) technical committee. In addition, she has served on the editorial board of two journals and has done a substantial amount of conference and symposium organization, including serving as co-organizer for an international meeting for ICME.

External Reviewers:

Reviewer A: "The (aforementioned) pioneering works of Dr. Thornton on computational modeling of both energy conversion and storage materials have served as an inspiration to many of us in the computational materials science community."

Reviewer B: "She delivered a phenomenal lecture, which resonated well with an entire audience of over one hundred experts...Everything in Prof. Thornton's dossier points to a scholar. Her attention to teaching and education is worthy of praise, her publications are outstanding, and her fundraising skills would be the envy of many."

Reviewer C: “Katsuyo is one of the pioneers in modeling microstructure evolution in energy materials... (She) is an international leader in computational materials science, particularly in the area of predicting complex three-dimensional microstructures...”

Reviewer D: “Katsuyo is best known to me for her efforts to initiate and sustain a discussion on computational materials science and the need to insert it into the undergraduate curriculum...I think she deserves substantial credit for her leadership in this...”

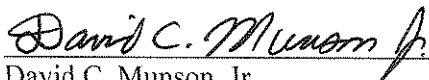
Reviewer E: “Dr. Thornton is an excellent scientist in the area of computational materials science, certainly one of the best of her generation in this field.”

Reviewer F: “...she has been a key driver moving the field forward through summer schools on ICME and in her leadership in key committees...Michigan students are very fortunate to have a faculty member whose work is characterized by rigor and who is committed to making difficult topics accessible.”

Reviewer G: “I have always been very much impressed with her attention to scientific rigor and technical details, and the thoroughness with which she conducts her work...She has developed a highly visible research program in computational materials science and engineering, which has a significant impact within the broader integrated computational materials science and engineering community.”

Reviewer H: “She has demonstrated the ability to do world-class research, attract considerable research funding and manage a large and active research group covering a diverse range of projects...I have been very impressed by Dr. Thornton’s application overall. It reveals a talented, hardworking researcher and an inspirational teacher who has made a very substantial contribution across the board.”

Summary of Recommendation: Professor Thornton has established a highly visible and very productive research program in the area of computational materials science where she is recognized for her pioneering work in simulations of microstructural evolution in a wide range of materials and in the development of new computational methods. She has established an excellent record of teaching and mentoring graduate and undergraduate students and she has a solid record of service, particularly at the departmental and national level, including a major national role in development and dissemination of computational materials science and engineering curricula. It is with the support of the College of Engineering Executive Committee that I recommend Katsuyo S. Thornton for promotion to professor of materials science and engineering, with tenure, Department of Materials Science and Engineering, College of Engineering.



David C. Munson, Jr.
Robert J. Vlasic Dean of Engineering
College of Engineering

May 2015