

PROMOTION RECOMMENDATION
The University of Michigan
College of Literature, Science, and the Arts

Stephen Maldonado, associate professor of chemistry, with tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of chemistry, with tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	2006	University of Texas, Austin
B.S.	2001	University of Iowa

Professional Record:

2014 – present	Associate Professor, University of Michigan
2008 – 2014	Assistant Professor, University of Michigan
2005 – 2008	Post-doctoral Fellow, California Institute of Technology

Summary of Evaluations:

Teaching – Professor Maldonado is an excellent teacher. His courses include a 200-level Introduction to Analytical Chemistry lecture course, a 400-level Instrumental Analysis lecture course, and a 600-level Electrochemistry graduate lecture course. Student E&E evaluations place him in the high quartile, and these scores are consistently superior to other fine teachers in the same courses. He has updated course content to reflect trends in the field and to better match course content to desired skills for industry and graduate education. Professor Maldonado has also developed an authentic research experience for undergraduate student in his introductory chemistry lab. Besides this course work, he has been active and successful at integrating undergraduate students into his research lab. His record of 21 undergraduate students and twelve papers featuring undergraduate authors is exemplary.

Research – Professor Maldonado is a materials chemist with an excellent research record. Making semiconductors is big business because these materials are at the heart of electronics, computers, and most types of solar cells. Creation of semiconductor materials is currently performed in large factories that utilize expensive, high temperature processes. Professor Maldonado has developed a creative, low-temperature method of semiconductor preparation based on electrodeposition on liquid electrodes. It is important that most solar energy harvesting is done with a photoanode, where light results in an oxidation in solution. Professor Maldonado has explored photocathodes based on Ga-P, a material that is strikingly efficient at converting light to electricity. He has developed surface chemistry that enhances the stability of the devices needed to enable actual use in any solar energy application. He is also engaging his undergraduate laboratory to develop novel perovskite solar materials. Perovskites have photovoltaic properties that make them well-suited for solar energy conversion and there is intense interest in their development. Professor Maldonado is incorporating development and testing of new recipes into his Chem 130 class allowing freshman students are making discoveries about the viability of different materials.

Recent and Significant Publications:

- “Electrochemical liquid phase epitaxy (ec-LPE): A new methodology for the synthesis of crystalline group IV semiconductor epilayers,” with J. DeMuth, et al., *Journal of the American Chemical Society*, 139, 2017, pp. 6960-6968.
- “Macroporous p-GaP photocathodes prepared by anodic etching and atomic layer deposition,” with S. Lee, et al., *ACS Applied Materials Interfaces*, 8, 2016, pp. 16178-16185.
- “Electrochemical liquid-liquid-solid (ec-LLS) crystal growth: A low temperature strategy for covalent semiconductor crystal growth,” with E. Fahrenkrug, *Accounts of Chemical Research*, 48, 2015, pp. 1881-1890.
- “Electrochemical liquid-liquid-solid crystal growth of germanium microwires on hard and soft conductive substrates at low temperature in aqueous solution,” with E. Fahrenkrug and J. Biehl, *Chemistry of Materials*, 27, 2015, pp. 3389-3396.

Service – Professor Maldonado’s service record is excellent. He has served reliably on several important departmental committees, including the Executive, several search, and the Graduate Admissions Committees. He is the chair of the Chemistry Facilities Committee, which is charged with ensuring that instrumentation and facilities support is at the level needed. He has also been actively involved in the college’s Machine Shop Advisory Committee where he plays an important role in helping ensure that the shop serves the research mission of the college. Professor Maldonado is also involved in several external boards and societies for electrochemistry researchers. He is active in helping increase the diversity of the department’s graduate population by attending several conferences that encourage students from under-represented groups to attend graduate school.

External Reviewers:

Reviewer (A)

“I have been very impressed by the very high standard of Professor Maldonado’s work with its strong focus on semiconductor electrochemistry. His work is particularly marked by its novelty of approach and evident originality of thought This body of work on LLS electrodeposition is original and of a very high standard with high quality characterization of the deposited semiconductor materials and a clear focus on the important questions, materials and potential applications.”

Reviewer (B)

“Stephen is an outstanding and productive scientist who carries out research of the highest quality. ...[his] research program is diverse, fascinating, and incredibly productive...a first-rate research program. ...I am convinced that his recent work on the epitaxial electrodeposition of crystalline silicon films...is an extremely important and useful discovery. ...he is doing fabulous science, he is overseeing a very productive research group, whose students are going on to a diverse array of careers, and he has been the recipient of many prestigious awards.”

Reviewer (C)

“He made an important discovery during his probationary period at Michigan, and subsequent developments have only further confirmed my feeling that he is one of the best, and most creative...electrochemists [of his cohort] in the US. ... Maldonado has made a series of

important discoveries...and these discoveries continue, seemingly unabated. ... I am sure he will continue to be a very strong credit to your institution.”

Reviewer (D)

“He is widely regarded as a rising star in the field. Since receiving tenure in 2014, Steve has advanced his laboratory in several exciting new directions. ... Since tenure, Steve has proven that ec-LLS and now, ec-LPE, are highly generalizable tools for the electrodeposition of a variety of semiconducting materials that have not been accessible by electrodeposition in the past. This constitutes a defining, distinctive, and impactful research contribution.”

Reviewer (E)

“His successful generation of crystalline germanium and silicon at remarkably low temperatures was, in my opinion, a seminal discovery... The fact that his approach avoids high temperatures and can be run under benchtop conditions with inexpensive equipment makes it a ‘green’ process that I think will have a tremendous impact. ... I think Prof. Maldonado has very high visibility at the national and international level, consistent with the high quality of work he has produced.”

Reviewer (F)

“Overall, my impression is that Dr. Maldonado has developed into an international leader in the field of materials electrosynthesis. He has an excellent reputation within the general electrochemical community. ... All of these traditional metrics suggest that Dr. Maldonado has established and is maintaining a very strong program at UM, consistent with my high opinion of his research.”

Summary of Recommendation:

Professor Maldonado has an excellent record of research, teaching, and service. His research program is very productive and has a solid funding record. He receives extraordinarily high student evaluations for teaching a variety of classes, and he has performed valuable service in the department and for the broader scientific community through his leadership in scientific societies. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Associate Professor Stephen Maldonado be promoted to the rank of professor of chemistry, with tenure, College of Literature, Science, and the Arts.



Andrew D. Martin, Dean
Professor of Political Science and Statistics
College of Literature, Science, and the Arts

May 2018