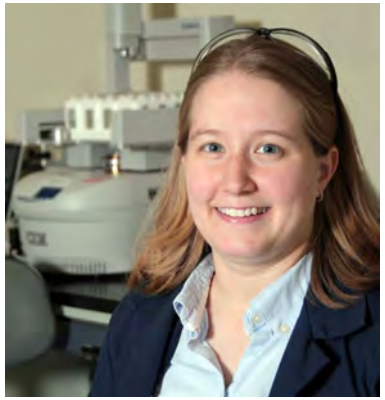

2010-2011 POCC Lecture Series

January 27, 2011, 8:00 PM

Dr. Grace S. Vanier

CEM Corporation

The Microwave Revolution: Recent Advances in Microwave Assisted Peptide Synthesis

Carolyn Hoff Lynch Lecture Hall
Chemistry Building, University of Pennsylvania

The Philadelphia Organic Chemist's Club

POCClub.org

Grace S. Vanier received her B.S. from Canisius College (2000) in Buffalo, NY and Ph.D. in chemistry at UNC Chapel Hill with Professor Michael T. Crimmins (2005). From there she moved to CEM Corporation in Matthews, NC as the Senior Scientist for the Synthesis Division. In 2008 she was promoted to Product Manager of the Bioscience Division, and in August of 2010 she also took on the Synthesis Division. She is the author of several papers and patent applications, and she has been invited to present at numerous conferences worldwide. Her research interests span the entire realm of microwave assisted chemistry including organic synthesis, peptide synthesis, and materials research.

Abstract: One of the greatest breakthroughs in solid phase peptide synthesis (SPPS) in the past decade is the use of microwave irradiation to overcome incomplete and slow reactions typical of conventional SPPS. Microwave energy has been applied successfully in a manual and automated approach for enhancing the synthesis of peptides and peptidomimetics. During the course of conventional peptide synthesis, the growing peptide chain can form aggregates with itself or neighboring chains producing low quality peptides. Due to its highly charged resonance structure, the peptide bond will readily absorb microwave energy inducing molecular motion within the peptide. This random motion can overcome chain aggregation within the peptide allowing for free access to the N-terminus of the growing peptide chain, and therefore results in a significant increase in the peptide purity. In addition, microwave irradiation can considerably increase the speed at which peptides are synthesized. Traditionally, peptide coupling reactions require from 30 minutes up to two hours to reach completion. Microwave energy allows the amino acid coupling to be completed in just five minutes. The Fmoc deprotection reaction can also be accelerated in the microwave decreasing the reaction time from at least 15 minutes to only three minutes. We have recently demonstrated common side reactions such as racemization and aspartimide formation are easily controllable with optimized methods that can be applied routinely.[1] Our latest research has focused on the microwave assisted synthesis of modified peptides. Such modifications include N- and C-terminal modifications, cyclizations, and the incorporation of unnatural amino acids. We have also continued to develop methods for the synthesis of difficult peptides. These peptides were synthesized in a fraction of the time compared to conventional peptide synthesis without the need for unusual or expensive reagents and in a fully automated fashion to give peptides in high yield and purity.

[1]Palasek, S. A.; Cox, Z. J.; Collins, J. M. *J. Pept. Sci.* 2007, *13*, 143-148.