華美化學與化工學會
Chinese-American Chemical Society (CACS)

2017 Fall Banquet

At the AIChE Annual Meeting
October 31, 2017, Minneapolis, MN, USA
Registration Fee: $40/person
Online registration: https://www.aiche.org/conferences/aiche-annual-meeting/2017/ticketed-events
On-site registration available

Tuesday, October 31, 2017	
6:00 pm -- 6:30 pm	Registration and Social Hour
6:30 pm -- 6:40 pm	Welcome and Introductory Remarks, and Introduction of Keynote Speaker **Professor Nien-Hwa Linda Wang, Purdue University, CACS Board**
6:40 pm -- 7:40 pm	Dinner Banquet
7:40 pm -- 8:45 pm	Keynote Address: **DISTRIBUTED AMMONIA SYNTHESIS** **Professor Ed Cussler, University of Minnesota, USA**
8:45 pm -- 8:50 pm	Concluding Remarks **Professor Nien-Hwa Linda Wang**
9:00 pm	End of Banquet

Banquet Address (Catering food provided by Tea House):

Kenneth H. Keller Hall, Room 3-230

200 Union Street SE, Minneapolis, MN 55455

Contact Phone Number: (515) 864-1486

(Taxi pool to the banquet is available at convention center and please see detailed information on the ticket or website)

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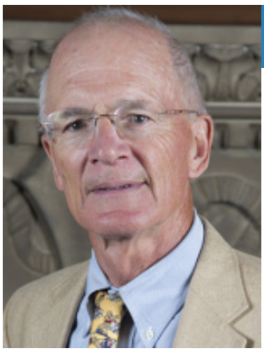
Keynote Address:

DISTRIBUTED AMMONIA SYNTHESIS

Professor Ed Cussler
Distinguished Institute Professor
Department of Chemical Engineering and Materials Science
University of Minnesota, USA



Abstract

We are developing a small-scale ammonia synthesis plant powered by wind energy. This is a major departure, because ammonia is currently made with energy from fossil fuels, especially natural gas. In contrast, the wind energy used here is sustainable but stranded, far from urban population centers but near locations of ammonia fertilizer demand. The wind energy is converted to electricity used for pressure swing absorption of air to make nitrogen, and for electrolysis of water to make hydrogen. Nitrogen and hydrogen are combined in a small-scale Haber process to

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synthesize ammonia. However, because of the plant's small size and large capital, the ammonia made costs about twice as much as that made from fossil fuels.

To reduce this capital, we are making the ammonia with a conventional catalyst but an absorption using ammines. The rate limiting step can now be not the chemical kinetics or ammonia condensation, but the speed of the pump recycling the unreacted gases. The absorbents, which originally had a capacity of one percent stoichiometric and a regeneration time of six hours, now have a capacity of over 50% stoichiometric and a regeneration time of five minutes. Because the operating pressure drops from 130 to 20 bar, the capital required for the process is reduced.

Our studies explore the feasibility of this small process to harvest stranded energy. The ammonia produced can either be used in rural areas as a fertilizer or in urban areas as a hydrogen carrier for fuel cells. Whether it is successful in practice is not yet known.

Biography

Ed Cussler, Distinguished Institute Professor at the University of Minnesota, was educated at Yale (BE, 1961) and Wisconsin (PhD, 1965). After thirteen years at Carnegie-Mellon University, Cussler joined the University of Minnesota in 1980. He has written over 250 articles and five books, including *Diffusion*, *Bioseparations*, and more recently, *Chemical Product Design*. Cussler, who served the American Institute of Chemical Engineers (AIChE) as President, was awarded the Colburn (1975) and Lewis (2001) awards, and was the Institute Lecturer (2014). He holds honorary doctorate degrees from the Universities of Lund (2002) and Nancy (2007). Cussler is a Fellow of the American Association for the Advancement of Science and a member of the National Academy of Engineering. His current research interest is the production of ammonia from stranded wind energy, that is, "putting wind energy in a bottle."

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