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Registration Fee of \$1,595 (US) must accompany registration form.

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http://inside.mines.edu/outreach/cont_ed/shortcourses.shtml

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Further Information

For information about the program, contact:

Office of Special Programs and Continuing Education (SPACE)
Colorado School of Mines
tel: 303.273.3321; fax 303.273.3314; space@mines.edu

For technical information, contact:

Dr. E. Dendy Sloan: esloan@mines.edu, 303.273.3723
Dr. Carolyn A. Koh: ckoh@mines.edu, 303.273.3237
Dr. Amadeu K. Sum: asum@mines.edu, 303.273.3873

http://inside.mines.edu/outreach/cont_ed/shortcourses.shtml



Join us!



June 10–12, 2009

2009 SUMMER WORKSHOP

Natural Gas Hydrates In Flow Assurance

Colorado School of Mines

Center for Hydrate Research
Chemical Engineering Department

Taught by: E. D. Sloan, C. A. Koh, and A. K. Sum



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Natural Gas Hydrates In Flow Assurance is an intensive summer workshop that is sponsored by the CSM Center for Hydrate Research. It will be offered June 10-12, 2009 on the Colorado School of Mines campus in Golden, Colorado.

PURPOSE AND SCOPE

This workshop is primarily aimed at engineers and scientists concerned with controlling/managing natural gas hydrate formation during gas/oil production and transportation. The objective of this workshop is to provide a fundamental review of the practice and theory in natural gas hydrates, with applications primarily in flow assurance. The workshop material will also include a broad overview of the key lessons learned in the industry over the last 20 years, including field case studies. The course material will be presented by lectures and hands-on training and practice in calculating hydrate phase equilibria and plug dissociation for field case studies.

Each attendee will receive a CD and hardcopy of the course materials; a copy of the SPE monograph *Hydrate Engineering* authored by E.D. Sloan, and executable programs developed at CSM to calculate hydrate thermodynamics (*CSMGem) & dissociation (**CSMPlug). Supplementary notes can be obtained from a separate purchase of "Clathrate Hydrates of Natural Gases" by Sloan and Koh, (CRC Press, 2008).

REGISTRATION AND FEES

Enrollment applications will be accepted in the order received. The sponsor reserves the right to cancel the course and return registration fees if sufficient registrations to defray expenses are not received. The registration fee is \$1595 payable at the time of registration. Cancellations will be charged a \$150 service fee. No refunds will be made to participants who fail to substitute or cancel at least 5 working days before the start of the course. The fee includes tuition, text materials, supplies, coffee breaks and lunches. It does not include lodging. Participants will receive 2 CEUs for the hours of instruction included in this course.

ACCOMMODATIONS

Registrants are responsible for making their own lodging and travel arrangements. For local accommodations visit: www.mines.edu/outreach/cont_ed/accommod.html. Super Shuttle provides transportation between Denver International Airport & Golden: 303.370.1300, www.supershuttle.com.

COURSE LECTURERS

Dr. E. Dendy Sloan, Jr., *Weaver Distinguished Professor*

Dr. Sloan received his degrees in Chemical Engineering and had five years experience with DuPont before coming to teach at the Colorado School of Mines in 1976. He has over 30 years experience in gas hydrate research with applications to flow assurance. He is the Chairman of the International CODATA Hydrate Database. He has co-authored more than 200 papers, particularly in the areas of gas hydrates, vapor-liquid equilibria, and fluid properties. The third edition of his book "Clathrate Hydrates of Natural Gases" (2008) was co-authored by Professor Koh. His second book, "Hydrate Engineering" (SPE Monograph 21) was published in 2000. He is a Fellow of the American Institute of Chemical Engineers.

Dr. Carolyn A. Koh, *Associate Professor*

Dr. Koh received her degrees from University of W. London and Postdoctoral training at Cornell. She was a Reader (Associate Professor) at London University before joining the Colorado School of Mines in 2004. She has been visiting Professor at Cornell and Penn State and London University. She was a consultant for the Gas Research Institute in Chicago and is a Fellow of the Royal Society of Chemistry. She has been working on hydrate research for over 11 years using spectroscopy, neutron diffraction and computer simulation techniques. This work led to her award of the Young Scientist Award of the British Association for Crystal Growth.

Dr. Amadeu K. Sum, *Assistant Professor*

Dr. Sum received his degrees in Chemical Engineering from the Colorado School of Mines and University of Delaware, and Postdoctoral training at University of Wisconsin at Madison. Before joining the Colorado School of Mines in 2008, he spent four at Virginia Tech as an assistant professor. He is currently a DuPont Young Professor recipient. He has been working with hydrate research for over 16 years using high pressure measurements, Raman spectroscopy, and molecular simulations.

* CSM Hydrate Consortium and **DeepStar Consortium have sponsored development of CSMGem and CSMPlug hydrate programs.

COURSE SCHEDULE (June 10 • 11 • 12)

| Day | Time | Activity |
|----------------------|-----------------------|---|
| WEDNESDAY | 8:00–8:30 a.m. | Registration |
| | 8:30–9:00 a.m. | Orientation |
| | 9:00–10:45 a.m. | Introduction to Hydrates in Flow Assurance & Safety Considerations of Hydrate Plugs |
| | 10:45–11:00 a.m. | Break |
| | 11:00–12:30 noon. | Physical & Rheological Properties |
| | Noon–1:30 p.m. | LUNCH |
| | 1:30 p.m.–3:30 p.m. | Phase Equilibria & Inhibition – Hydrate Prevention by Design Case Studies |
| THURSDAY | 3:30 p.m.–3:45 p.m. | Break |
| | 3:45 p.m.–5:30 p.m. | Hands-on Practical |
| | 5:30 p.m.–6:30 p.m. | Phase Equilibria & Inhibition Calculations Social Hour |
| | 8:00 a.m.–9:15 a.m. | Hydrate Time Dependent Properties & Low Dosage Inhibition |
| | 9:15 a.m.–9:30 a.m. | Break |
| | 9:30 a.m.–11:30 a.m. | Hydrate Time Dependent Properties (continued) & Industry Case Studies |
| | 11:30 a.m.–12:30 p.m. | Open Forum |
| 12:30 p.m.–1:30 p.m. | LUNCH | |
| FRIDAY | 1:30 p.m.– 3:00 p.m. | Hydrate Plug Remediation & Industry Case Studies |
| | 3:00 p.m.–3:15 p.m. | Break |
| | 3:30 p.m.–5:30 p.m. | Hands-on Practical Hydrate Plug Dissociation Calculations |
| | 8:00 a.m.–9:15 a.m. | Hydrate Transient Measurements and Modelling |
| | 9:15 a.m.– 9:30 a.m. | Break |
| FRIDAY | 9:30 a.m.–10:45 a.m. | New Technologies for Controlling Hydrates & Hydrate Detection Technologies |
| | 10:45 a.m.–Noon | Macroscopic & Molecular Methods for Measuring Hydrate Formation & Decomposition |
| | Noon –1:00 p.m. | LUNCH |
| | 1:00 p.m.–2.30 p.m. | Final Design Application of Course Materials |