Spring 2010 COLLOQUIUM SERIES

GRANULAR AND MULTIPHASE FLOWS

Sponsored by

The Granular Science Laboratory

Prof. Richard Hogg

Professor Emeritus – Mineral Processing and GeoEnvironmental Engineering

Penn State University

University Park, PA 16802

April 5, 2010

11:30 a.m. – 1:00 p.m.

Mechanical Engineering Center - Room 224

Mixing and Segregation of Powders

The need to prepare mixtures of powders is common to innumerable practical and industrial applications. In addition to difficulties in achieving acceptable uniformity in mixtures, problems often arise in maintaining homogeneity in the face of spontaneous segregation of the components during subsequent handling and processing operations. Mixing in powders generally results from relative motion of groups of particles – convective mixing – or of individuals – diffusive mixing. Segregation or demixing occurs when the motion of individual particles is biased according to their particular characteristics – size, shape, composition etc. In the absence of such bias, individual motion invariably leads to homogenization of the mixture. An overview of procedures for assessing homogeneity, of the mechanisms and dynamics of mixing and demixing (segregation) will be presented. Relationships between mixing/segregation processes and the external and interparticle forces responsible for causing or opposing relative motion will be reviewed. Specific examples of mixing and segregation in flow over surfaces, in rotating cylinders and other applications will be described.

Richard Hogg is Professor Emeritus of Mineral Processing and GeoEnvironmental Engineering at The Pennsylvania State University. He received a BSc from the University of Leeds in 1963 and MS (1965) and PhD (1970) degrees from the University of California, Berkeley. He joined the Penn State faculty in 1969 and served as Chair of the Mineral Processing Program from 1986 to 1998 and of the Geo-Environmental Engineering Program from its inception in 1993 until his retirement in 2000. He was the recipient of the Wilson Distinguished Teaching Award, from the College of Earth and Mineral Sciences at Penn State, in l980; the Antoine M. Gaudin (1994) and Arthur F. Taggart (1997) awards from SME; the Frank F. Aplan Award, from the Engineering Foundation in 1998 and the Frank Tiller Technical Award from the American Filtration & Separations Society in 2000. Dr. Hogg's research interests cover many aspects of particle technology including particle characterization, analysis of mixing and segregation phenomena, size reduction and agglomeration processes. Contributions in the area of colloid science include analysis of forces of interaction among dispersed particles, dispersion stability, coagulation and flocculation of fine particle suspensions.

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