CIM Distinguished Lecturer 2016-2017

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1- Advanced micro alloyed steels for sustainable pipelines

Canada ranks third in the world, for gas and crude oil reserves. Production and transmission of oil and gas are key components of Canada's economy. As conventional supplies of oil and gas are being exhausted, new sources of energy must be harvested from increasingly harsh environments using new technologies. New challenges have also emerged such as CO_2 injection for enhanced oil recovery. The technological challenges of transporting these resources from production sites to markets requires construction of an infrastructure for transportation to processing hubs in Western Canada and to markets in Eastern and Western Canada, and the U.S. Both production and transmission of oil and gas from these remote locations demand improved materials to ensure reliability, public safety and environmental protection. This is required in order to provide Canadians with a sustainable infrastructure for energy delivery. This presentation will describe nearly two decades of collaboration between industry and university to advance and improve micro alloyed steels which are used for the transmission of oil and gas.

2- The evolution of the philosophy of engineering education

The profile of corporations doing business in Canada is increasingly international. According to data collected by Statistics Canada, our exports in manufacturing and natural resources to the USA have been dropping to the point where they are presently less than 80% while those to other countries (China, Europe, etc.) have been increasing. We have entered a period in Canada where an engineer graduating in the 21st century, must have been taught using the apprenticeship model (i.e. industrial internships), the fundamentals model (i.e. learning and applying fundamentals through course work) and must also acquire Global Competency (GC). GC is learning to be sensitive to cultural diversity, having the ability to collaborate with diverse engineering colleagues, and learning how to work in multinational corporations with distributed job sharing. This presentation will outline the need to expand the curriculum of young engineers to include GC as an important component of their undergraduate education.

3- Quantifying solidification path in rapid solidification using 3D measurements

Most metals and alloys processed undergo a solidification processing step. Increasingly, there is a growing number of solidification processing routes that involve rapid solidification of the alloy. These include strip casting, high pressure die casting, 3D printing, and atomization for the production of powders or spray formed parts. By contrast, there are few experimental techniques developed to study the solidification path of alloys during rapid solidification. Amongst these laser melting and solidification, Electromagnetic Levitation (EML) and Impulse Atomization (IA) are the most prominent. Of relevance is the formulation of the solidification path of an alloy and the resultant identification and quantification of metastable phases and their relationship to processing conditions. This typically involves the understanding of the interplay between undercooling and cooling rate for the various phases that form. This presentation will outline some of the methodologies developed to quantify phase fractions and their solidification path as a function of processing conditions using EML and IA.

Biography

After completing the MEng at McGill University (1975) and a PhD at UBC (1981), Hani took up a faculty appointment at Carnegie-Mellon University, in Pittsburgh. In 1989, he moved to the University of Alberta, actively teaching and doing research on pipeline steels, metal-matrix composites and rapid solidification. He now partners with industry in research and has extensive international collaborations. As part of his mentoring activities, Hani formulated an international work abroad program for undergraduate students in several high-quality engineering programs in Europe and Japan, placing over 80 students since 2002. In 2011, he formulated a Dual Degree Program with the Université de Lorraine. Amongst his distinctions are five best paper awards, the prestigious Killam Research Fellowship and the Metals Chemistry Award. He has been inducted Fellow of ASM International, CIM and the Canadian Academy of Engineers. He was also MetSoc President in 1998, past editor of CMQ, and the 2014 President of the Minerals, Metals and Materials Society (TMS).

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