The Department of Mechanical Engineering/College of Engineering and Applied Sciences

Stony Brook University

Mechanical Engineering Seminar



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**Lecture Title: Future Trends on Low Cost Silicon-based Photovoltaic Production**

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**Abstract**

Cost of solar module was reduced to $1.2/watt recently and it roughly equals to $0.15/kwh. Could the price of solar electricity be further reduced to $0.08/kWh in next 3-5 years? The answer is yes and the time for low cost PV energy comparable to conventional energy may be shorter than what we think. If the traditional casting including no crucible electromagnetic casting is categorized as the first generation, currently widely used directional solidification process can be considered as the second generation. The key features of the second generation process are the heat exchange block and limited moving parts. Such furnaces have advantages in multi-crystalline silicon production. However, it may not be suitable for mono-like or mono silicon casting. The third generation furnaces should be able to produce mono silicon casting with high quality at low cost. Together with the process optimization, it is possible to avoid side nucleation, which is detrimental for mono-crystal growth. Meanwhile, the process should also be energy-efficient with high productivity (high growth rate). China is currently in the leading position for third generation development. $0.08/kWh could be achieved based on the third generation process together with thin wafer (<100micron) technology. Meanwhile, thin and high efficiency direct silicon film is considered as the four generation technology. In the fourth generation technology, silicon casting and wafer making will, no longer, be necessary. Unsolved problem includes production efficiency, thickness control, and uniformity on large size. With the advancement of solar cell production, it is possible to produce high efficiency solar cells using thin and direct wafers.

**Biography**

Hui Zhang is a “Changjiang Scholar” professor in the Department of Engineering Physics, and serves as an associate director of the Institute of Public Safety Research in Tsinghua University, as well as the associate director of Tsinghua-Boeing Joint Research Center. He is a member of ISO/TC223 (societal security) and is currently in charge of establishing ISO standard on emergency capability assessment. Before he joined Tsinghua University in 2007, he was an associate professor in the Department of Mechanical Engineering at the University of Stony Brook, SUNY and director of process modeling laboratory. His primary research lies in the area of disaster prevention and mitigation, thermal/fluid science, crystal growth, and thermal spray coating. Currently, he is the PI of a key research program of NSFC and the PI of a major research program of NSFC. He received the National Science Foundation CAREER Award (USA) in 1999 while he was an assistant professor in SUNY Stony Brook, USA. He published 8 book chapters and 104 journal articles.

