ADVANCES IN HELIUM ION MICROSCOPY ? A QUICK OVERVIEW IN INSTRUMENTATION AND APPLICATIONS DEVELOPMENT

Doug Wei, Ph.D., Sr. Scientist
Ion Microscopy Innovation Center
Carl Zeiss Microscopy, LLC, Peabody, MA 01960

Abstract: Helium (Neon) ion microscopy is a new member in the charged particle microscopy family. It was developed based on gas field ion source (GFIS) technology with which helium atom is ionized into He⁺ pieces in a strong electrical field and then driven through a column by electron static lens to form a focused ion beam. A scanning microscope can then be built using this focused He ion beam. Different from scanning electron microscopy (SEM) that uses negatively charged electrons as a source, He ion microscopy (HIM) uses positively charged He⁺ beam as a source. This has opened a new field for applications not only because of the difference in charge, but a He ion is about 7300 times heavier in mass than an electron, making it practical for sputtering materials away, leading to an ideal fabrication tool in sub-nanometer to nanometer regime. Since its launch in 2007, the development of HIM has moved from high resolution microscopy to high precision nanofabrication and analytics. A brief overview of the history and development of HIM will be presented in this talk with emphasis on fundamentals and applications.

Bio of Dr. Wei: Doug Wei earned his bachelor’s and master’s degrees in chemical engineering from Tianjin University in China in 1986 and 1989, and PhD in chemistry from Tokyo Institute of Technology in Japan in 1996. He spent more than 15 years in catalysis research focusing on energy conversion at universities and
research organizations in China, Japan and the United States. Studying structures of catalytic materials intrigued his interest in electron microscopy and he decided to pursue a career in electron microscopy around 2000. After years of running a university EM lab at NJIT, he joined Carl Zeiss Nanotechnology Systems as a product manager for transmission electron microscopy in 2005. In later 2007, he moved to Harvard University, Center for Nanoscale Systems to assist building the electron microscopy center as the company’s technical expert, till the end of 2010. He also led the Carl Zeiss NTS North America applications team from 2008 thru 2011 for some key applications projects. From early 2012, he moved to Carl Zeiss Ion Microscopy Innovation Center (Peabody, MA) to lead application development activities for the newly developed Helium/Neon ion microscopy.

Contact Prof. Jiming Bao (jbao [at] UH [dot] EDU) if you would like to arrange for a time to meet with Dr. Wei.