

The Department of Mechanical Engineering presents:

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National Institute for Occupational Safety and Health (NIOSH)

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11:10AM-12:00PM

Winston Chung Hall 205/206

In pursuit of a direct-on-filter method for
measuring silica in filter samples of airborne dust

Abstract:

Worker exposure to airborne dust containing silica continues in mining and many industries, despite considerable knowledge regarding causes and means of mitigation. Exposure to silica is currently determined by taking filter samples of airborne dust and submitting them to a laboratory for analysis by a standard method using lab-grade instruments, usually either an infrared spectrometer or an X-ray diffractometer. Since this process entails a time lag of days to weeks before exposure data are received, the information is often of little use to inform modifications to workplace conditions aimed at reducing exposures. To remedy that, NIOSH is investigating a variety of potentially portable spectrometry methods for their applicability to in-field measurement of silica on dust samples. This presentation describes the spectrometry methods evaluated, including infra-red absorbance, X-ray fluorescence and laser induced breakdown spectroscopy, and the analytical hurdles encountered. Methods were evaluated for sensitivity and accuracy using dust samples that were generated in the laboratory or collected in mines. Preliminary results are summarized as they support our choice of using FTIR to develop a field portable, "direct-on-filter" method for measuring airborne silica in workplaces. Data is presented for estimating silica in numerous mine dust samples, including ways to mitigate analytical confounders, and use of multi-variate analytical methods to estimate silica content from raw FTIR spectra. A path forward is described, toward a field-portable, user-friendly "silica measuring system".

Biography: Art Miller received his doctorate in Mechanical Engineering from the University of Minnesota in 2005, where his research focus was on diesel emissions and nanoparticle formation. Art's background is diverse, including work as an aircraft mechanic and pilot, a stint at the Technical University of Berlin in turbulence research, and nearly ten years in engineering and research with the US Bureau of Mines in Minneapolis, MN. For the past fifteen years he has worked at the National Institute for Occupational Safety and Health (NIOSH) Spokane Research Lab where he has led a number of projects aimed at improving the health and safety of mine workers. His current research focus addresses the development of field-portable methods for measuring silica in mine dusts.

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