

Grant: AFC518-54

Title: Development of an Advanced Real-Time Personal Coal Dust Monitoring Instrument Based on Photo-acoustic Spectroscopy

Organization: University of Nevada, Reno

Principal Investigator: Karoly (Charles) Kocsis and W. Patrick Arnott

Topic: Health-related Monitoring Devices

Concept Summary: The focus of our research & development proposal target technology topical areas such as “*Health-Related Monitoring Devices*” and “*Enhanced Environmental and Atmospheric Monitoring Devices*”, with emphasis on the development of an improved personal coal dust monitoring device, mine air monitoring and response measures. Our goal is to prevent conditions, circumstances, or events that cause illness, occupational diseases, injury or death to mine workers. Our main target is to develop and manufacture a robust, accurate, reliable and light-weight real time coal dust monitoring instrument with ability to continuously measure and monitor respirable coal dust in the production workings and throughout the mines. Our RTPCD instrument will help the mine operators to promptly identify and respond to dust exposures exceeding the applicable MSHA standards, at any given time. Through continuous exposure readings, the RTPCD device will also enable the mine operators to rapidly evaluate the effectiveness of various dust control systems and strategies.

The main objective is to design, fabricate, test and commercialize a new “real-time personal coal dust” (RTPCD) monitoring instrument based on photoacoustic spectroscopy, which will empower the instrument to continuously measure and monitor concentrations of coal dust throughout surface infrastructures and underground mines. As opposed to any existing respirable coal dust measuring instrument, our device will be based on photoacoustic spectrometry, which will enable the unit to operate unattended for a prolonged period of time. This technology allows to construct the instrument as an intrinsically safe unit which can be used in hot, humid and dusty environments with minimum required maintenance. Through continuous dust exposure readings, the RTPCD device will help the mine operators to immediately identify and measure high “transient” dust concentrations, locate their sources, and determine the efficiency of various dust control systems and strategies. Our real-time dust monitoring instrument could be regularly carried by mine personal during production shifts. Due to its ability to operate unattended, the RTPCD unit could be easily connected to the mines’ exiting contaminant monitoring systems. This instrument will help reduce and possibly eliminate workers’ exposure to high concentrations of respirable coal dust in underground mines.