

MATERIALS SCIENCE AND ENGINEERING (MS&E) SEMINAR SERIES
Friday November 22, 2019 at 3:00pm in room ESB 207

“Development of a subsurface LIBS sensor for in situ groundwater quality monitoring”

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Abstract: Sub-surface activity such as geologic carbon sequestration (GCS) has the potential to contaminate groundwater sources with dissolved metals originating from sub-surface brines or leaching of formation rock. Therefore, a Laser Induced Breakdown Spectroscopy (LIBS) based sensor is developed for subsurface water quality monitoring. The sensor head is built using a low cost passively Q-switched (PQSW) laser and is fiber coupled to a pump laser and a gated spectrometer. The prototype sensor head was constructed using off the shelf components and a custom monolithic, PQSW laser and testing has verified that the fiber coupled design performs as desired. The system shows good calibration linearity for tested elements (Ca, Sr, and K), quick data collection times, and Limits of Detection (LODs) that are comparable to or better than those of table top, actively Q-switched systems. The fiber coupled design gives the ability to separate the PQSW LIBS excitation laser from the pump source and spectrometer, allowing these expensive and fragile components to remain at the surface while only the low-cost, all optical sensor head needs to be exposed to the hostile downhole environment.

Biography: Dustin L. McIntyre grew up in southern WV between Huntington and Charleston. He attended WVU and pursued a dual degree in Electrical Engineering and Computer Engineering graduating in December of 1998. He completed his Masters in Mechanical Engineering in August 2000. He completed his doctoral studies in May 2007 with his dissertation titled “A Laser Spark Plug Ignition System for a Stationary Lean-Burn Natural Gas Reciprocating Engine”. He is currently a team lead and researcher with the materials characterization division at the USDOE’s National Energy Technology Laboratory studying use of laser induced breakdown spectroscopy for use in down hole in-situ sensing applications. Dr. McIntyre is author/coauthor of over 50 journal papers, 7 patents, 4 book chapters, and 2 books.

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