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This is a short narrative that may help explain the linkage between Laser Induced Breakdown Spectroscopy (LIBS), along with the spectral "fingerprints" it generates, and the engineering characteristics to be tracked. Essentially, rocks and minerals possess certain engineering properties and their peculiar elemental spectral "fingerprints" can quickly identify those rocks and minerals. Bill Skerritt, retired Engineering Geologist in charge of approving and evaluating aggregates has summed it up very well with his statement, "What is being developed in this research is, essentially, a "petrographer in a box"". This is a very general statement of what this research is accomplishing but at the same time a very true statement.

The LIBS technology, if brought to fruition, will give extremely accurate and instantaneous (within seconds) results as to the aggregate identification and quality. This has already been proven by the high degree of accuracy in identifying aggregate in the three examples explored in the NCHRP 150 Report (ASR potential, pavement friction, and D-cracking susceptibility). This technology has the potential to be applied to any quality issue that emanates from an aggregate's mineralogical composition and from issues involving the use of aggregates not approved. LIBS is answering questions about specific aggregate engineering characteristics in seconds/minutes instead of weeks or months currently needed to conduct laboratory testing for these answers. LIBS will give inspectors "on the spot" data needed to make decisions. This, in short, will reduce QC testing issues to real-time nearly instantaneous results. LIBS can accurately identify aggregates coming from each individual bed within a quarry and alert the producer and consumer if aggregates from non approved beds have been/are being introduced in the stockpile or the mix. Existing stock piles can be checked to ensure aggregate in the stock pile is of an approved source. This allows instantaneous QA of the aggregate production at the quarry and aggregate use at the mixing plant. And since many LIBS tests can be performed in a very short period of time, statistical precision and accuracy is enhanced.

All this equates to very rapid and accurate results relating to QC/QA testing that now may take upwards of 6 months and are at times inaccurate. This can result in answers as to aggregate issues, mix issues, contamination issues, mix reactivity issues etc. all within a time frame that can prevent bad mixes from being mixed, leaving the yard or being placed. As is, some of these issues are not detected until the mix has already been placed which can result in costly monetary and time loss; plus a reduced service life of the pavement or structure.

There is significant potential for application of LIBS to QC programs for aggregate producers and mix suppliers and for rapid verification testing under QA for highway agencies with three very big payoffs, time, accuracy and improved QC/QA from the time of aggregate production to the use of the aggregate in the mix.

As of the writing of this narrative, the technology has evolved from a laboratory unit to a field prototype (pre-commercialization) unit capable of continuous aggregate monitoring in a laboratory or field environment. This effort has occurred with support through the NCHRP 150 Proof of Concept Study - Completed April 2012; NCHRP 168 Field Prototype Development and AASHTO Standard of Practice Preparation; and a New York State DOT Field Demonstration, planned for the Spring of 2013. The objective of the Pooled Funding effort is to expand the technology to aggregates around the country where it can be tested and demonstrated on local aggregate resources with specific quality control issues (e.g., ASR, D-cracking, Specific Gravity, Insoluble Residue, Deleterious Materials etc.)