## B148 Chemical Taggant Detection and Analysis Using Laser Induced Breakdown Spectroscopy (LIBS)

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Attendees to this presentation will understand the application of laser Induced Breakdown Spectrometry (LIBS) for use in the detection and analysis of an innovative chemical tagging system developed by Smartwater Technology, LLC, U.K.

The aim of this work was to validate the use of LIBS for the elemental analysis of these products as an alternative to the more complex and more expensive LA-ICP-MS methods already developed and used in our group. This presentation will impact the forensic science community by presenting a direct comparison of the performance of the LIBS analysis as compared to the LA-ICP-MS methods.

SmartWater Technology (Telford, Shropshire, U.K.) has developed a personal property coding system (SmartWater Tracer) which imparts a unique elemental fingerprint to any object it is applied. Using a combination of rare elements, SmartWater Tracer can be individualized to a consumer by varying the combination of the elements present. Once dry, the Tracer coding system can be removed and qualitatively analyzed by Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA- ICP-MS) for the presence or absence of any combination of possible elements. This study investigates the use of Laser Induced Breakdown Spectroscopy (LIBS) as an alternative, and perhaps more practical analysis scheme to LA-ICP-MS. Examples of LA-ICP-MS and LIBS for various solutions (and corresponding solids) at the target concentrations are presented.

The aim of this work was to validate the use of LIBS for the elemental analysis of these products as an alternative to the more complex and more expensive LA-ICP-MS methods already developed and used in our group. A direct comparison of the performance of the LIBS analysis as compared to the LA-ICP-MS methods is presented.

Single and double pulse LIBS experiments using a variety of excitation wavelengths (266, 532, and 1064 nm) were used and coupled to a research grade Mechelle Spectrometer coupled to an intensified CCD detector and also to a very inexpensive Czerny-Turner Spectrometer coupled to a CCD detector. A comparison between the LIBS Excitation wavelength and Spectrometer combinations will also be presented.

The discrimination power of the optimized LIBS system is compared to the well established LA-ICP-MS method for elemental analysis of these samples and similar polymer based samples of forensic interest. The results of this study have demonstrated that LIBS is a viable alternative to LA-ICP-MS for the elemental analysis of the Smartwater tracer product while providing excellent discrimination potential, sensitivity and repeatability of analysis.

**Chemical Tagging, Trace Evidence, LIBS**

 ** Presenting Author*