

Q: Is this the car that hit you?

A: It was black, or dark blue, or dark purple...



What is needed is a fast, simple way to distinguish between similar looking forensic material. In this case, we looked at paint chips



14306 Industrial Road, Omaha, NE 68144 U.S.A

# The CETAC LSX-213 Laser Ablation system is the perfect solution for the analysis of virtually any solid material



- Integrates seamlessly with the Varian, Thermo, PerkinElmer Elan ICP-MS or any other ICP-MS or OES
- Laser ablation is a versatile solid sampling technique, used for qualitative and quantitative analysis with ICP-OES and ICP-MS systems
- Useful for microscopic feature analysis for geological, forensic and failure analysis applications or macroscopic material identification
- Also useful for difficult to digest materials with reduced contamination risk compared to liquid digestion methods
- Capable of quantitative minor and trace analyses of virtually any solid or semi-solid material
- The DigiLaz213™ software allows a wide variety of ablation patterns and parameters
- Excellent illumination and digital video system allow precise imaging of samples with high intensity, polarized reflected and transmitted light sources

# CETAC LSX-213 simplified schematic

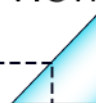
ICP & Laser Computer



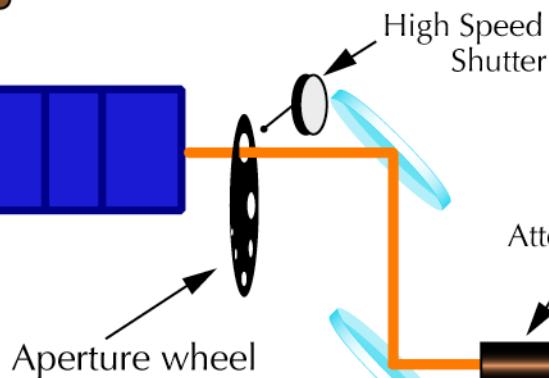
Computer Controlled zoom Camera



Roof Prism for viewing



Nd:YAG Laser >4mJ @ 213nm  
5 nanosecond pulsewidth



High intensity LED illuminator

Rotating Polarizer

Sample to ICP



Helium carrier gas

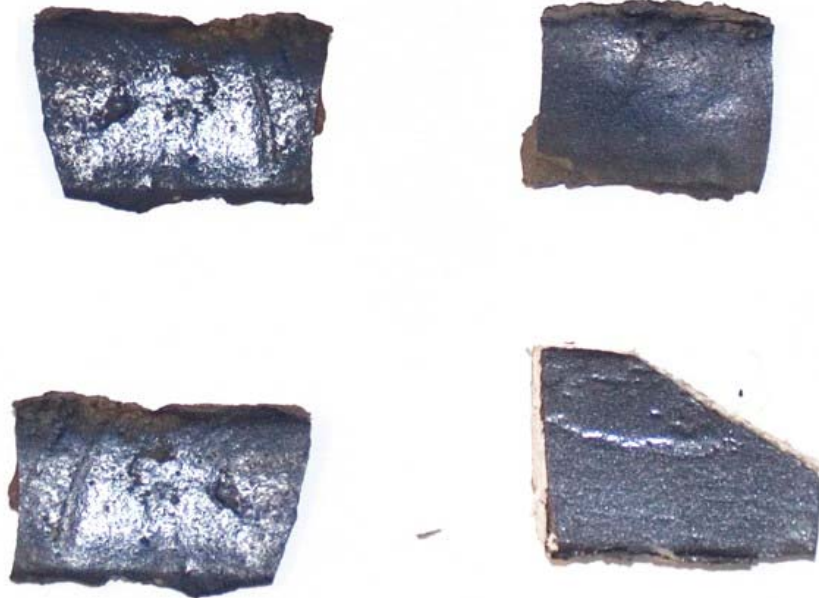
Polarized lower illuminator



## CETAC LSX-213

# Problem: Characterizing forensic material

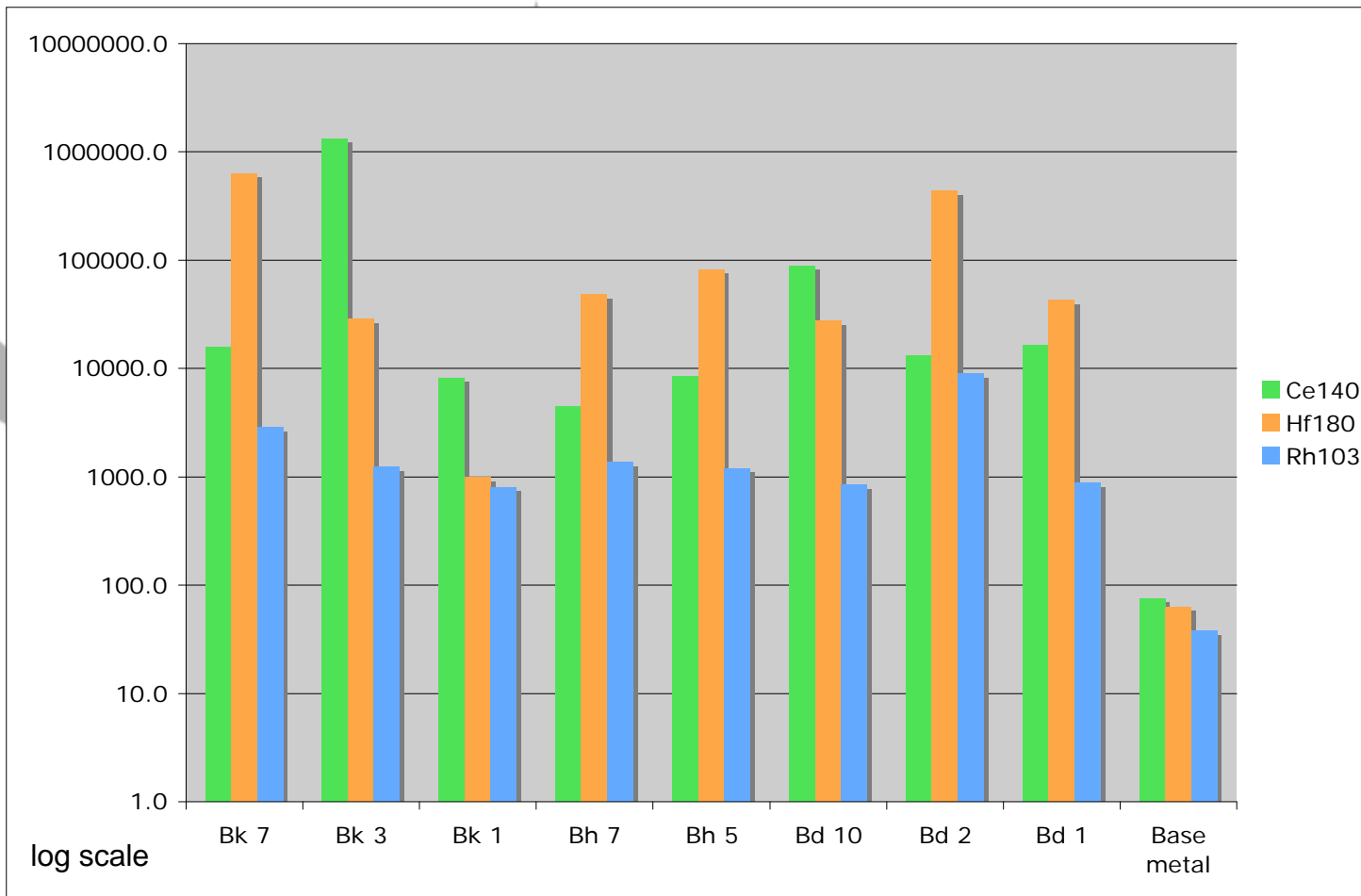
- Typically, paint chips are left at the scene of any auto accident
- In this example, we characterized a group of paints which appear very similar
- The goal is to get a rare earth “fingerprint” of each paint to differentiate samples as a fast and simple method requiring only gas blank subtracted intensities for analysis



# Auto Paint Analysis: Considerations

- Energy Attenuation is of great importance since the goal is to ablate only the paint while leaving the underlying surface intact
- The LSX-213 uses optical attenuation to give precise, linear energy levels
- Auto Paint primer is very high in Chromium making Cr<sup>52</sup> a good “break-through” indicator
- The “Metallic” look of auto paint is achieved using Aluminum flake, making the presence of Aluminum a quick indicator of this paint style
- Titanium Dioxide is nearly universal in auto paint and is the primary pigment. Titanium can be used to “normalize” other element values for semi-quantitative analysis of the pigment.
- For “finger printing”, rare earth elements are preferable due to their low environmental background and variability with various pigment raw materials
- Cerium, Hafnium and Rhodium were chosen due to their high degree of variability among samples and stable signal, indicating a homogenous distribution throughout the sample

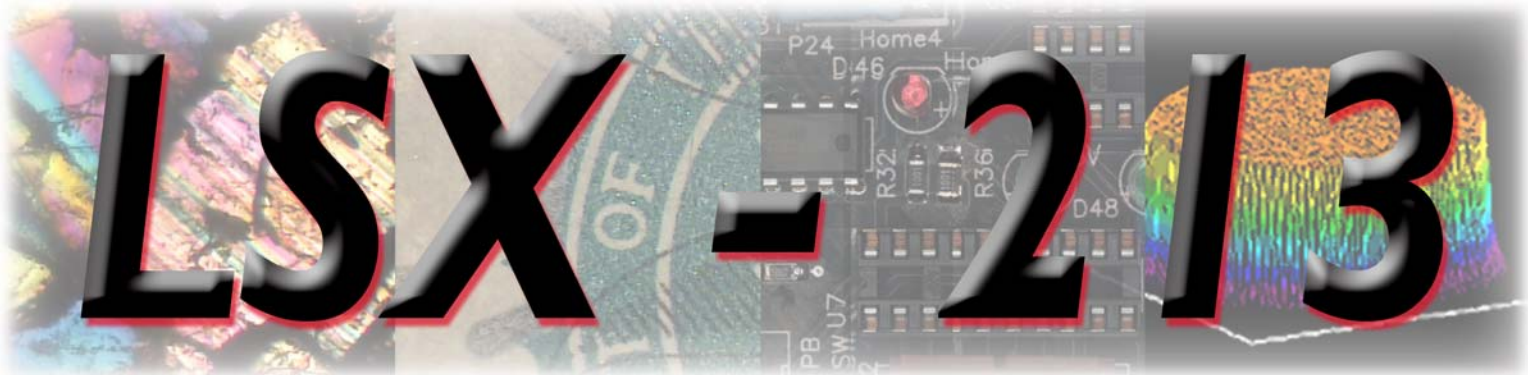
# Selected rare earth values from 8 paints, all “very dark blue or black”



When the intensities are plotted, each paint has its own pattern, each significantly different from the base metal and each other with one exception...

# Conclusions:

- Three paints looked very dark blue, however, based on the rare earth abundances it was clear that Bh7 and Bh5 were the same paint despite being visually indistinguishable from Bd2 - this was confirmed by the customer after analysis
- These data show that despite very similar appearance, the paint chips were quite easily discriminated
- Sample preparation consisted of wiping the paint chip off to remove any dirt and took a few seconds per sample
- Once clear markers were identified (Ce, Rb, Hf), abundance ratios could be established to quickly identify the paint.
- This method was very easy to develop; it is likely that other rare earth marker elements would yield the same results
- All element signals, except Iron, were well above the signal from the bare metal, indicating that the laser settings were such that only the paint was being ablated



**LSX - 213**



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