

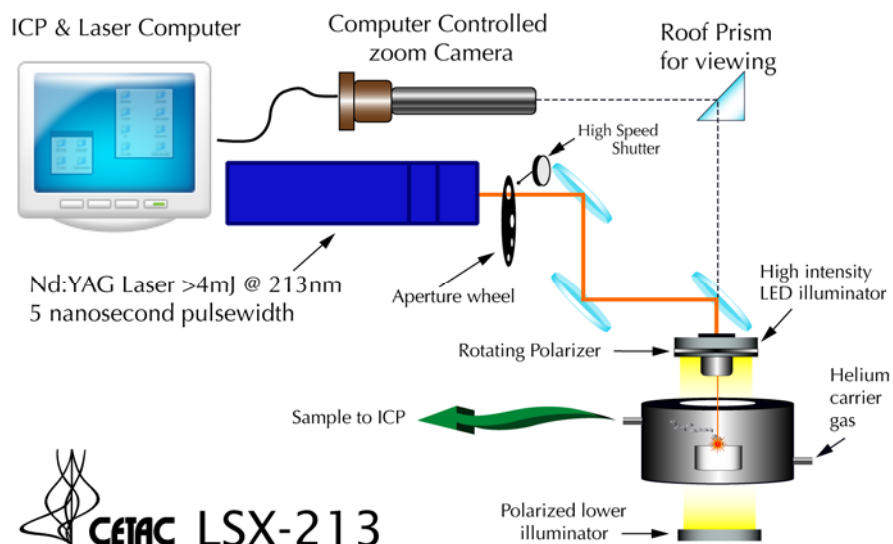
## Applications: Forensic Analysis

### •Sample Preparation: Laser

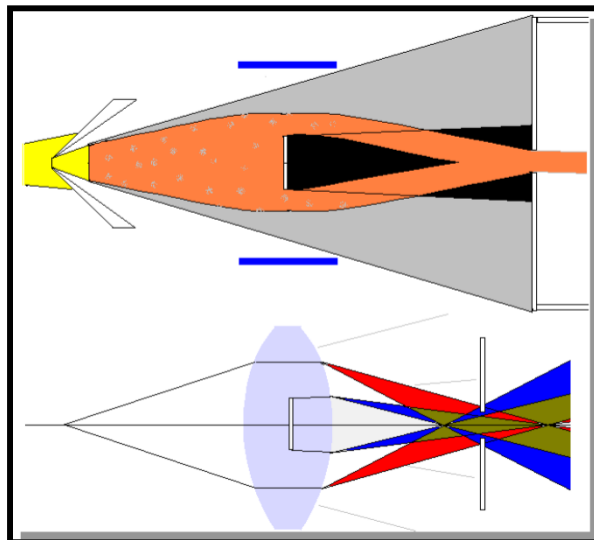
- Direct Solid Sampling
- Very Little Sample Prep
- Spatially Resolved In Situ Analysis
- Integrated software control



## LSX-213 schematic



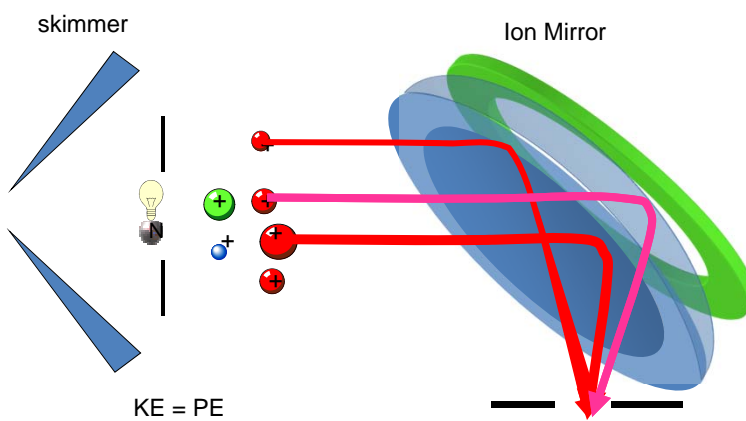
## Ion Optics - Photon Stop Design

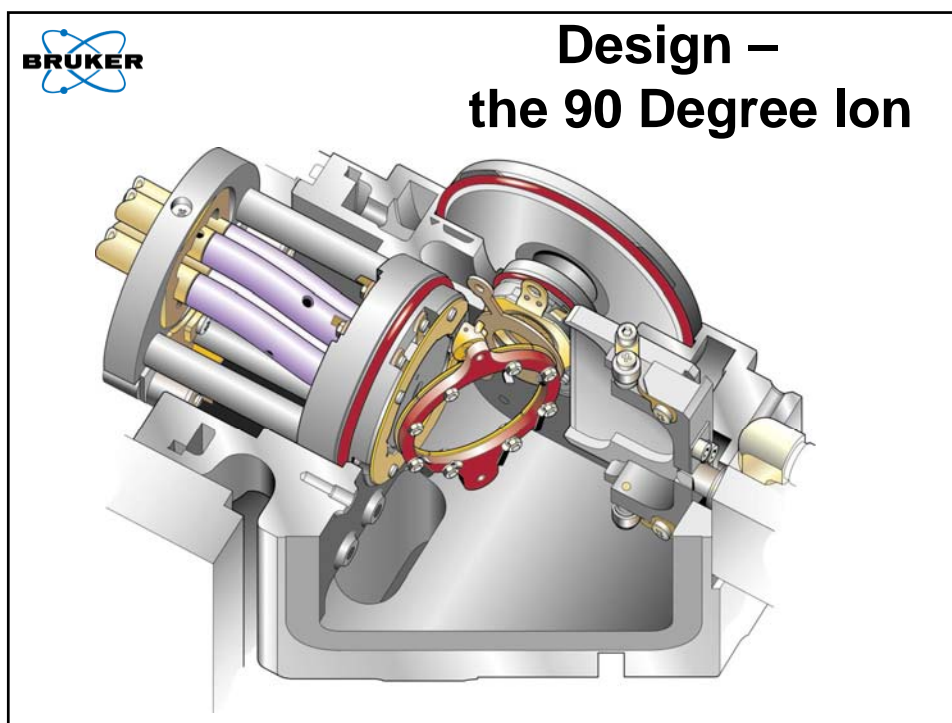


- Ion beam aberrations present
- Optical analogy – note different focal points
- (still used by one competitor)
- **About 10-15% efficient**



## 4 D Focusing of the Ion Mirror

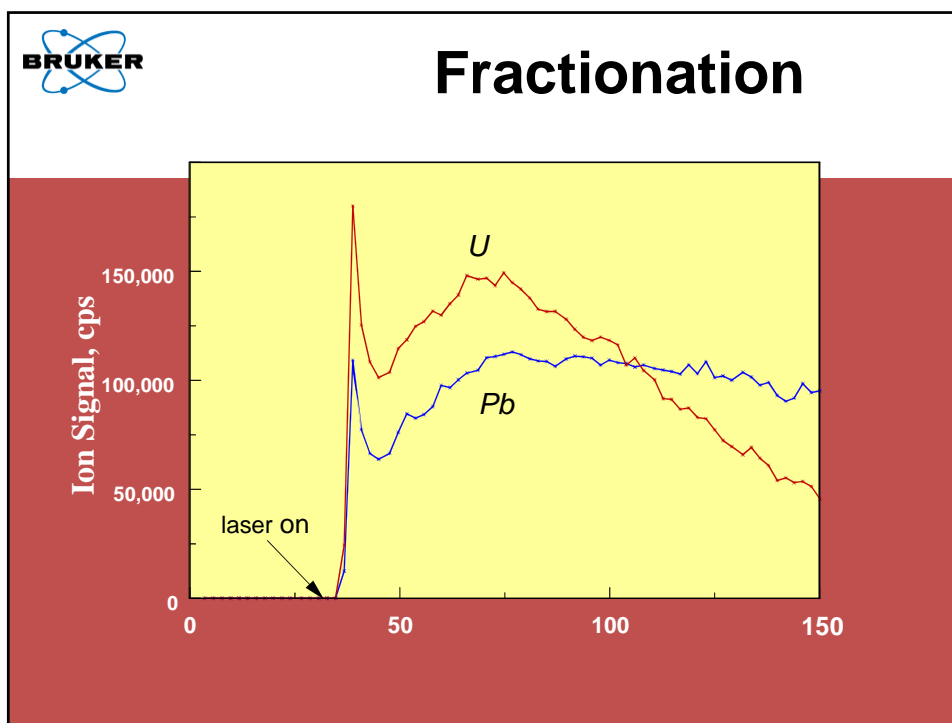




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## Fractionation

- Fractionation is defined as non-stoichiometric sampling
- It was originally believed that the laser was causing fractionation at the ablation site
  - This may still happen to some degree with all lasers in metal samples...melting
- Elemental fractionation can occur in three parts of the LA sampling process
  - At the ablation site
  - During transport
  - In the ICP
- Elemental fractionation has been shown to be reduced using lower wavelength lasers as compared to 266 nm system (smaller more easily ionized particles)

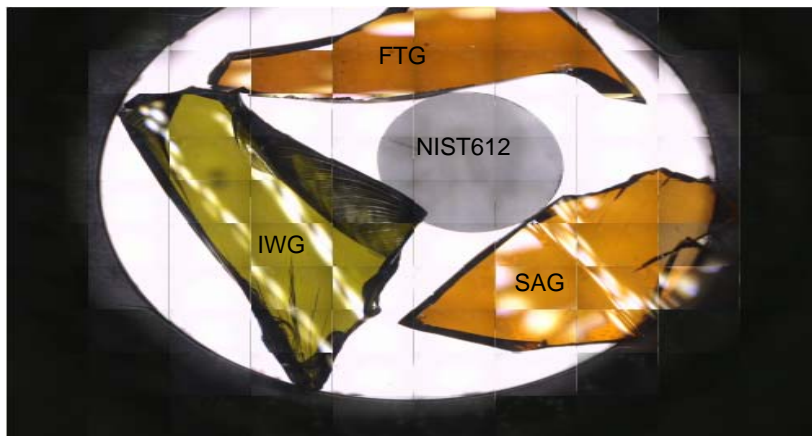


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## Fractionation and Forensic Analysis

- Quantitative Elemental Analysis
  - - Correct for fractionation
  - - Matrix match where possible
- Fingerprint Analysis
  - - Element ratios
  - - Isotope ratios
  - - Fractionation in laser ablation is a benefit

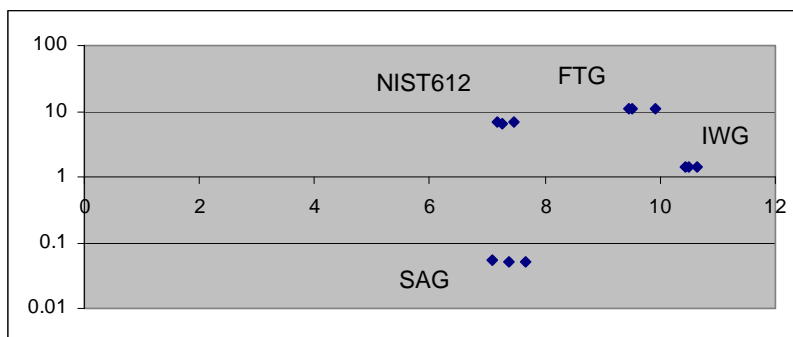
## Analysis of Glass Samples



200 micron spot, 10 Hz rep rate, 3mJ, 213nm

## Elemental Fingerprinting of Glass Samples

100 microns spot size, 10 Hz rep rate, 3mJ, 213nm



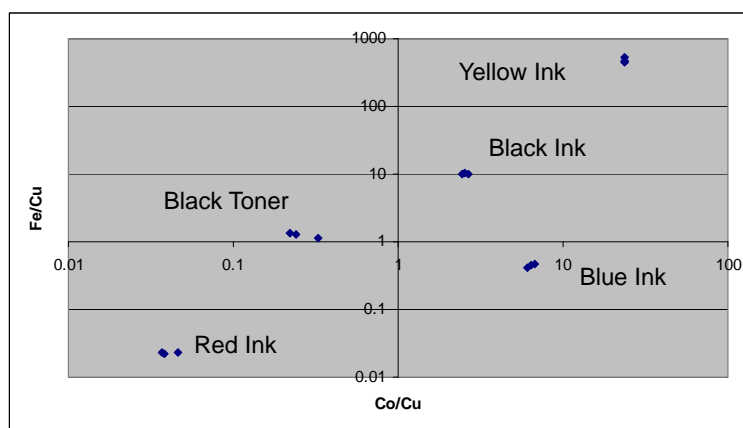
Plot of Al/Ca versus Mg/Ca for four glasses



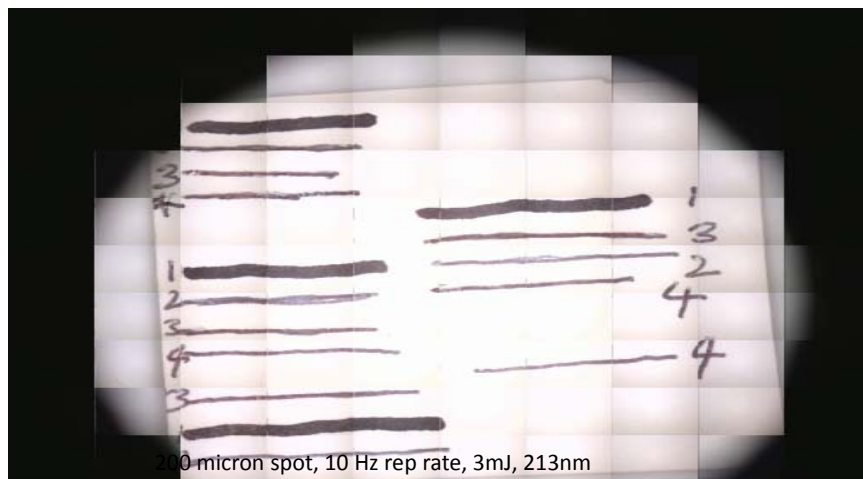
## Analysis of Colored Ink and Toner



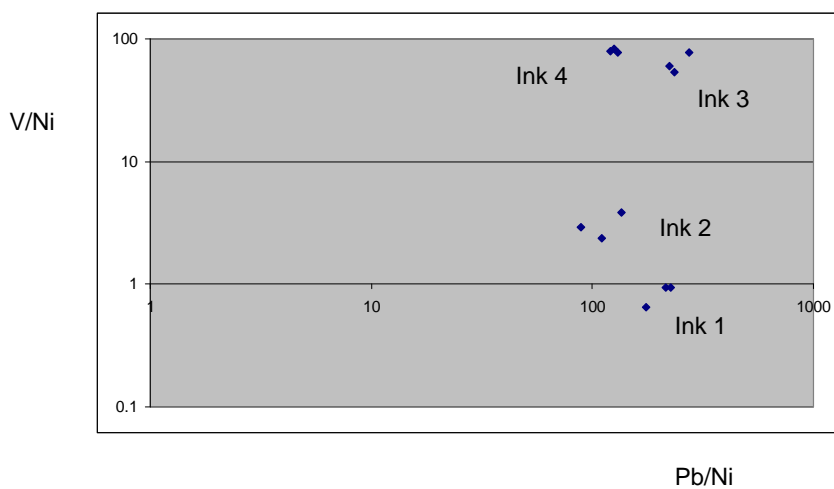
## Analysis of Colored Ink and Toner



## Analysis of Blank Ink

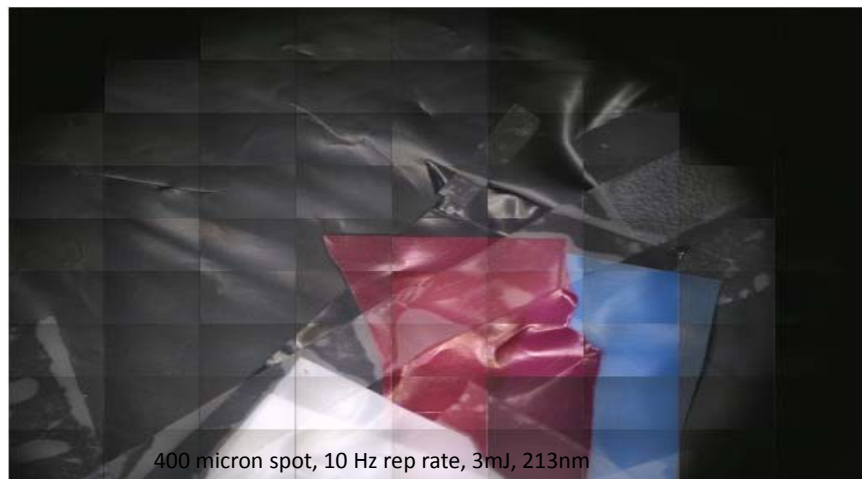


## Analysis of Black Ink





## Analysis of Trash Bags



## Analysis of Trash Bags

