

Electrospray Ion Beam Deposition of Complex Molecules on Surfaces in the Vacuum [†]

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Abstract: The electrospray deposition technique represents a gradual change in the range of scientific research through comparing between electrospray ion beam deposition and conventional deposition techniques. A new phase which is called deflection chamber stage has been added to the electrospray deposition source. This stage plays an important role by bending the ion beam in order to work towards separating two components of the beam. The number of molecules was deposited using this technique such as fluorescein, ferrocene, and mixture of fluorescein and ferrocene. As well as, I included some data for spraying different solutions by presenting four experiments which have collected using the electrostatic ion deflection.

1. Description of the Experiments

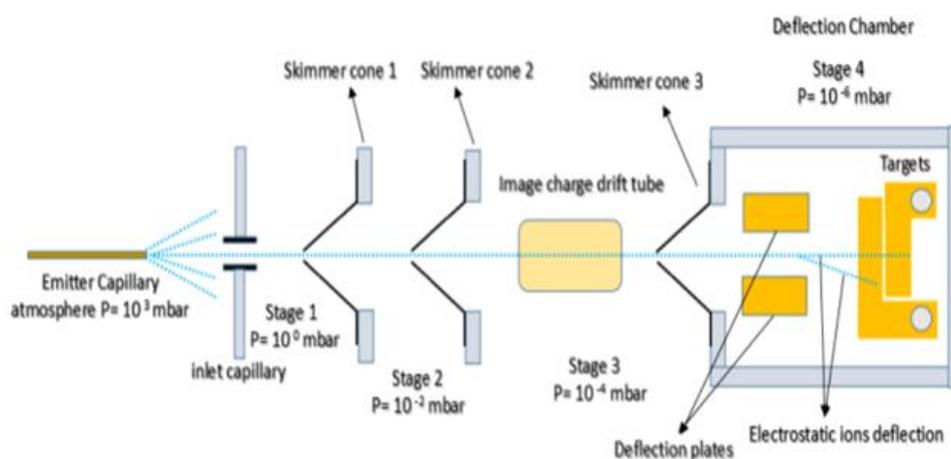


Figure 1. Schematic of electrospray deposition source including image charge drift tube and deflection plates to deflect the ion beam by bending. The ion pathways will disperse depending on the masses of the ions.

2. Discussion of the Experimental Results

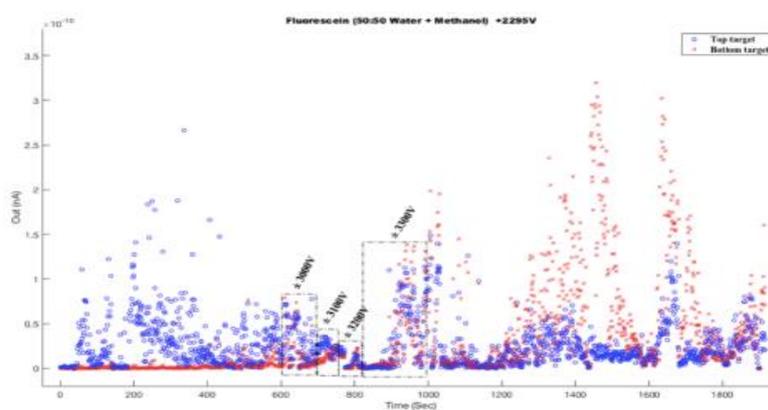


Figure 2. Data collected using electrostatic ion deflection for 1 mM fluorescein solution (50:50 water: methanol) sprayed at +2295 V. The dash-dotted lines indicate to equal currents in both targets at different deflection voltages.

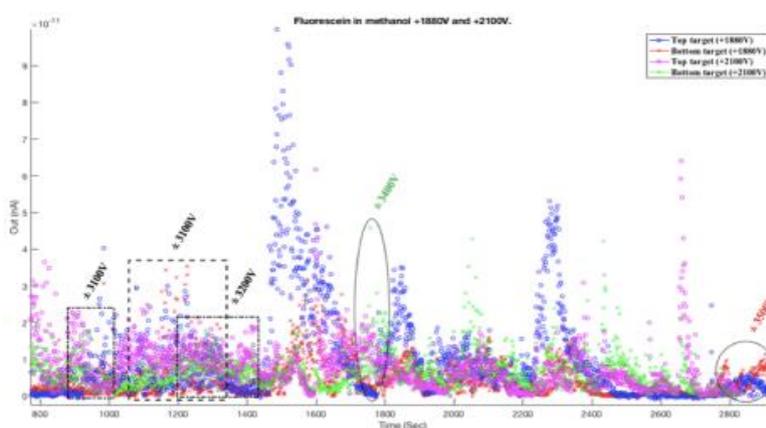


Figure 3. Plot zoom of combined data collected using electrostatic ion deflection for fluorescein solution in methanol sprayed at +1880 V and +2100 V. The dashed line applies to equalize current which sprayed at +1880 V. The dash-dotted lines indicate the same currents sprayed at +2100 V. Ellipses shape refers to the ions hitting the second target at ± 3400 V and ± 3500 V respectively.

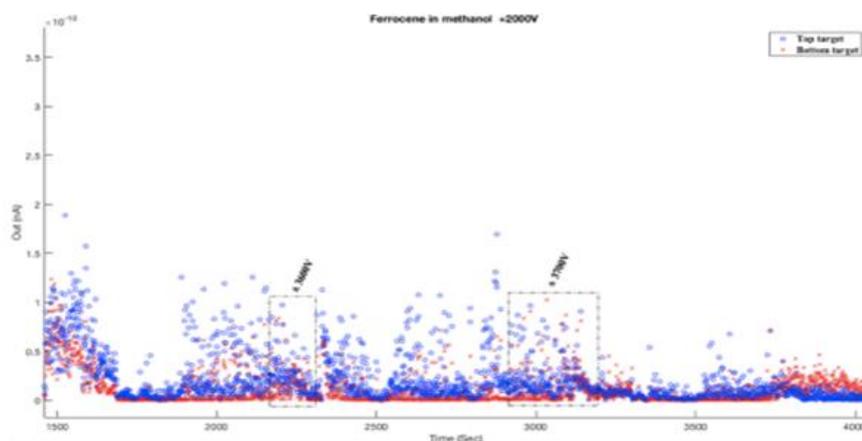


Figure 4. Data collected using electrostatic ion deflection for ferrocene dissolved in methanol sprayed at +2000 V. The dash-dotted lines indicate to the equalize currents for targets.

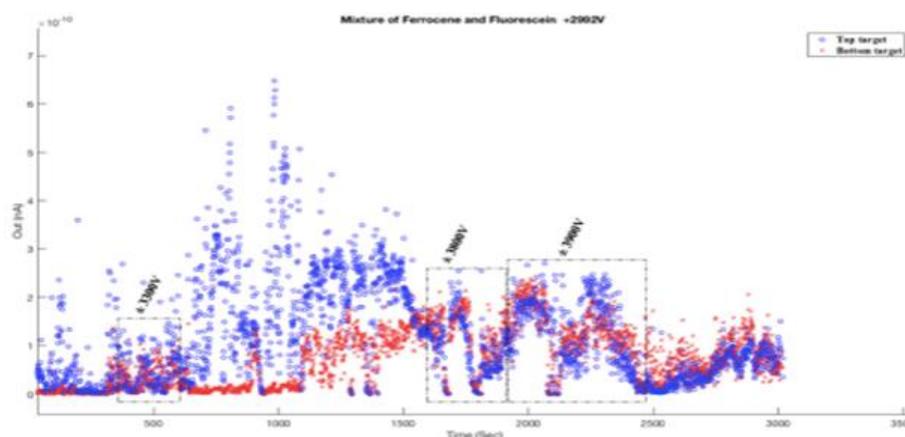


Figure 5. Data collected of a mixture of fluorescein and ferrocene dissolved in methanol sprayed at +2992 V. The dash-dotted lines refer to the equalize currents for targets.

3. Conclusions

- Deflection voltages for fluorescein dissolved in methanol + water and methanol only using +2295 V, +1880 V, and +2100 V were extremely similar.
- Ferrocene sprayed at +2 kV demonstrated the difference in the deviation voltages compared to fluorescein data.
- A mixture of fluorescein and ferrocene at +2992 V proved the success mentioned experiments where stated that the lighter molecules as ferrocene deflected more than the heavier ones as fluorescein.

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