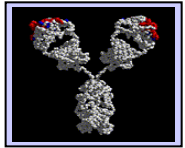


Use of piezoelectric inkjet printer in developing microfluidic-based multi-analyte immunoassay



Paolo Spicar-Mihalic

Department of Chemistry / Department of Bioengineering

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How do environmental conditions, immobilization method, and choice of substrate affect immunoassay performance?

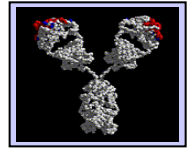
Proteins immobilized onto solid support express different properties than those in bulk solution. Use of piezoelectric inkjet printer enables immobilization of nanoliter/picoliter volume with sub-micrometer spatial resolution in all three axes.



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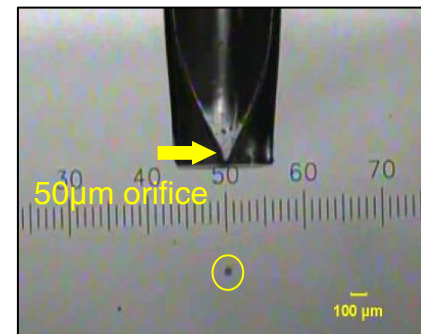
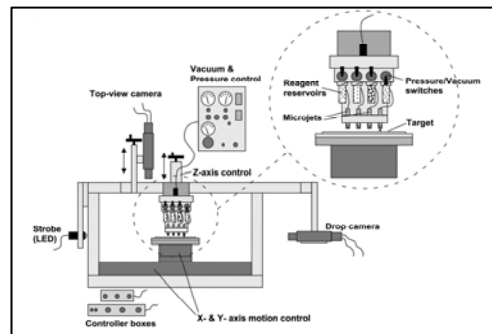
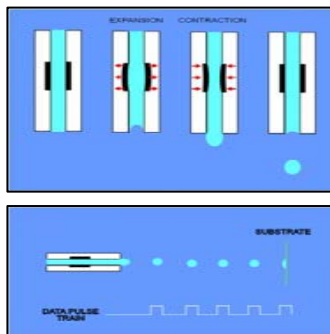


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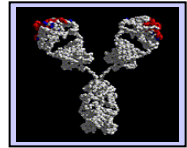


Research Approaches

- Proteins (antibodies and enzymes) are immobilized onto modified glass substrate and membrane substrates in nanoliter (picoliter) volume
- Resolution is in sub-micrometer range in all three axes (LabView software)
- Immobilization is performed in environmental chamber with controlled humidity and temperature
- Activity of immobilized proteins is investigated based on their activity (performance) in microfluidic-based immunoassay

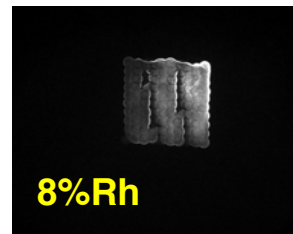
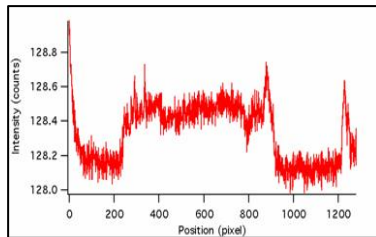
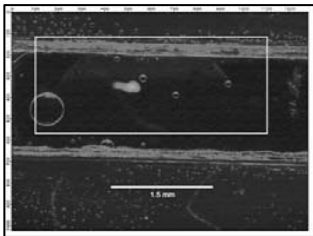


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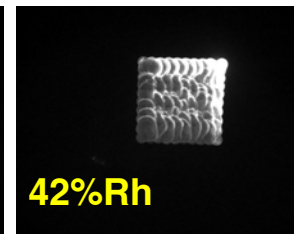


Done so far...

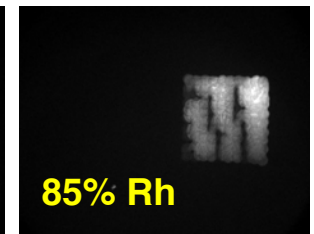
Physical adsorption



8%Rh



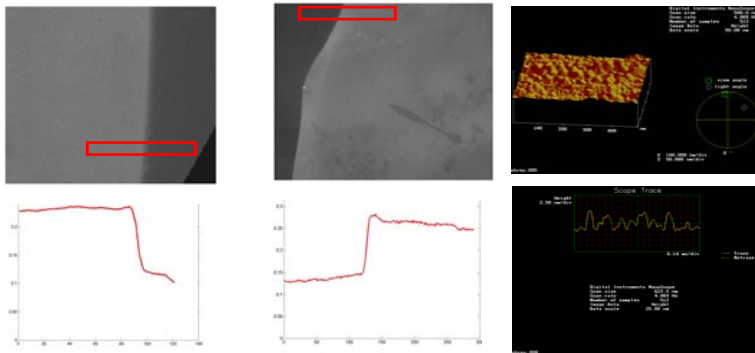
42%Rh



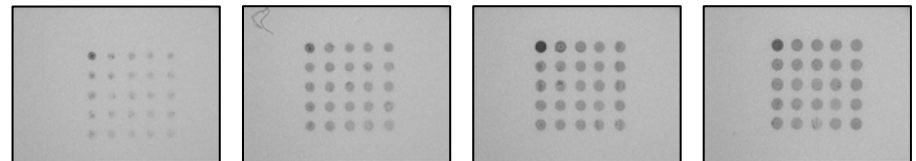
85% Rh

0.1mg/mL FITC labeled anti-horse IgG on Aldehyde modified glass substrate.
Center-to-center distance 50 μ m

Covalent immobilization via aldehyde- and epoxy-terminated silanes



Immobilization onto membranes



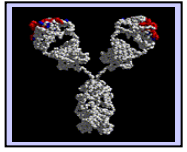
- 1) 0.1 mg/mL anti-aldolase HRP conjugate printed onto pure nitrocellulose membrane and developed with tetramethylbenzidine (TMB)
- 2) center-to-center distance is 300 μ m
- 3) Number of firing per spot: (A) 5, (B) 10, (C) 15 and (D) 20 respectively



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Future work



- move toward multiple analytes on the same device
- explore protein damage due to the nature of the piezoelectric printing
- take general exam 😊 and finish up thesis



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