Portable Nanosensors

Environmental nanotechnology aiding sustainability

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BINGHAMTON UNIVERSITY
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CBET Nanograntees December 3, 2012, Arlington, VA

Sustainable Nanotechnology Organization

Research | Education | Responsibility

Sustainable Nanotechnology (www.susnano.org)

Brundtland:
"**Development that meets the needs of the present without compromising the ability of future generations to meet their needs**"

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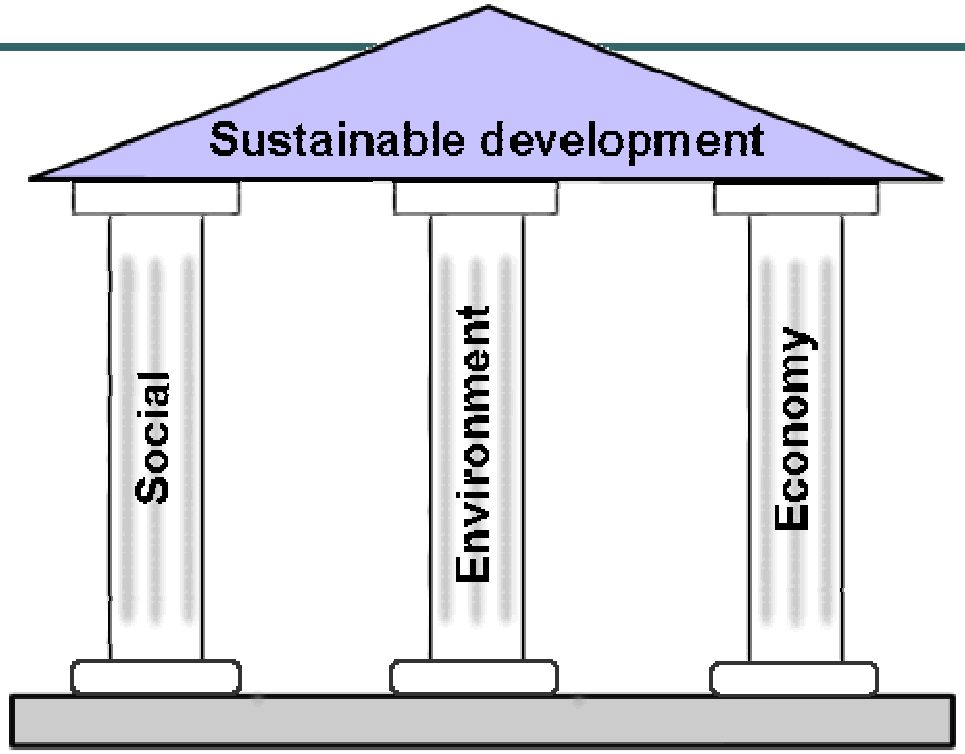
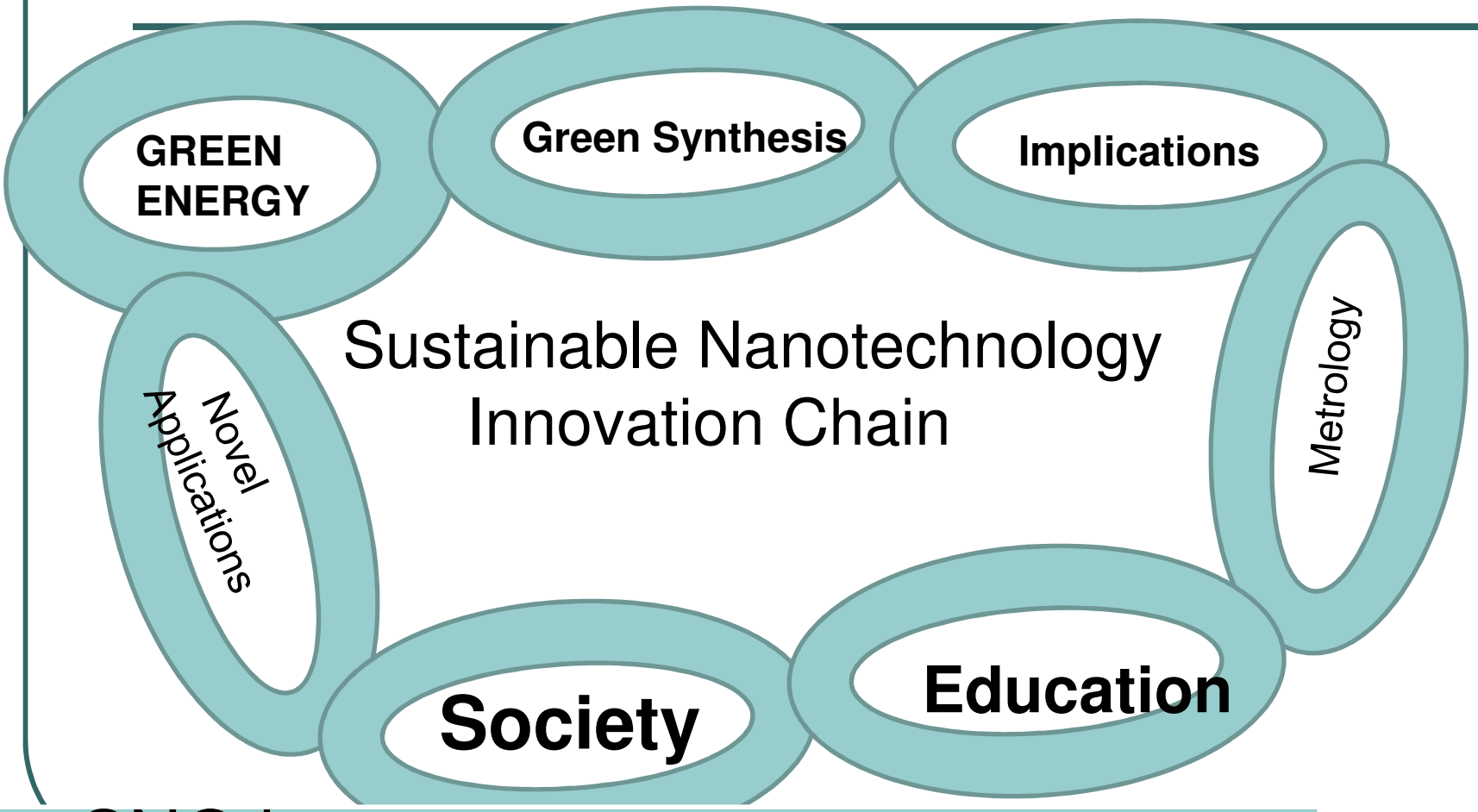
Pillars of sustainability



http://**restaurantsustainability.wordpress.com/2012/05/16/pillars-of-sustainability-addition-of-the-life-cycle-analysis/pillars-of-sustainability**

Sustainable nanotechnology



SNO is building an ecosystem of sustainable innovations in nanotechnology

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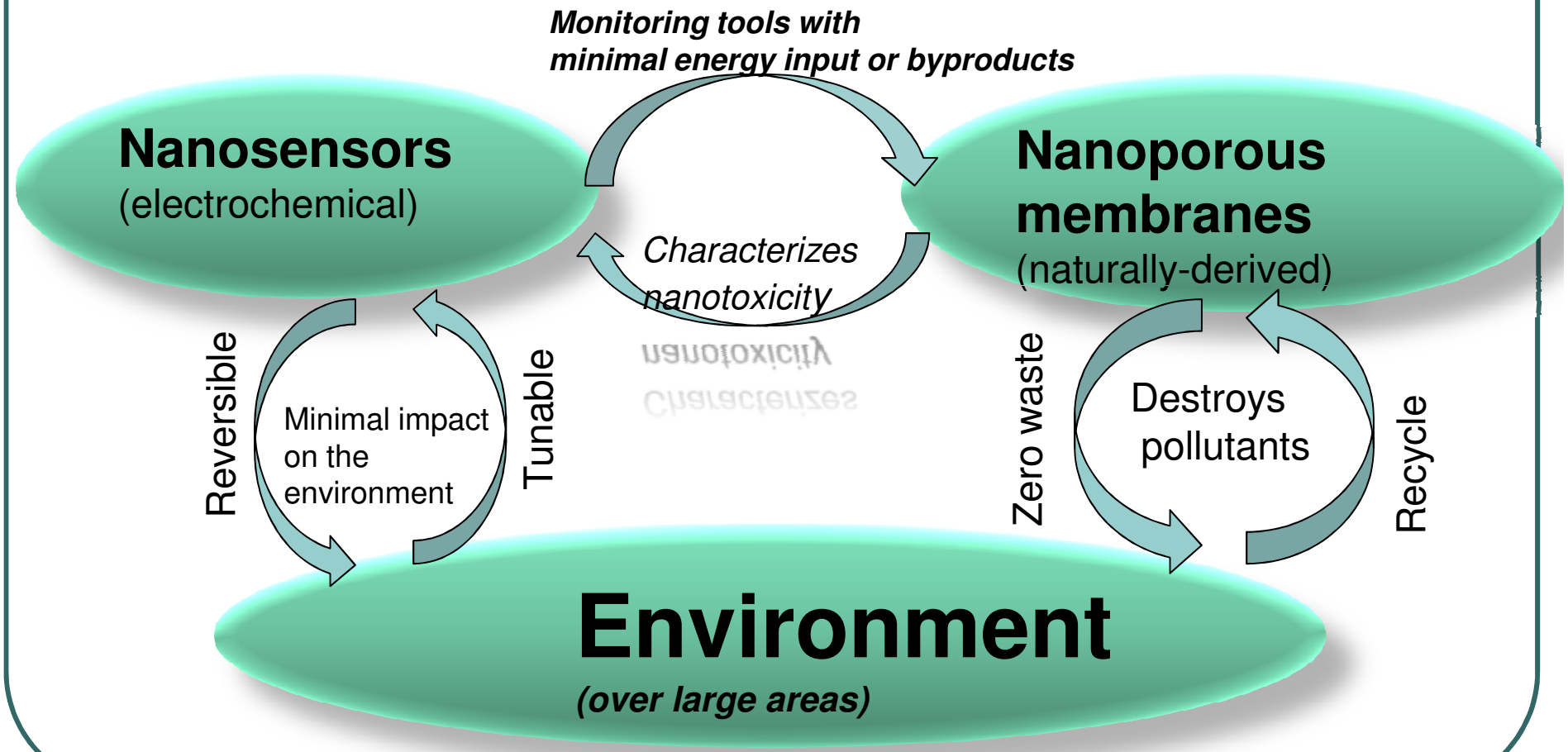
Project Goals & Objectives

- Develop an environmentally-relevant, portable nanoparticle analyzer which can measure various levels of nanomaterials directly from pure standards, simulated matrices and real-world samples
  - *The resulting technology should provide information about the size or shape of the nanoparticle, which are important factors for determining toxicity; as well as distinguish them from naturally-occurring particles.*

Sustainable Nanoconcept



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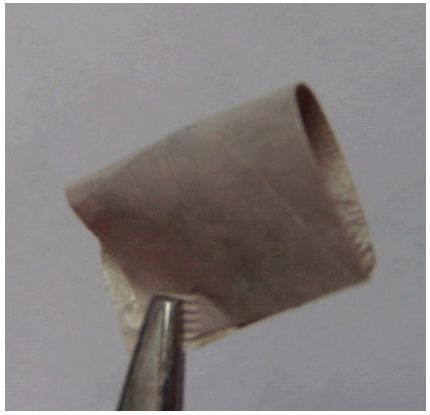
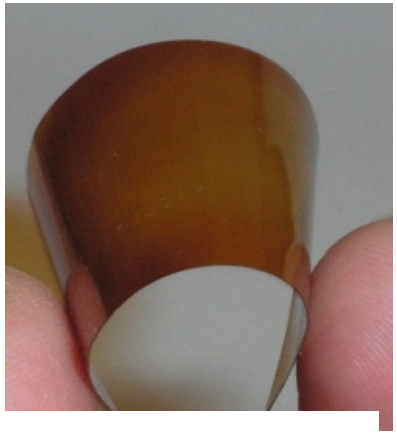
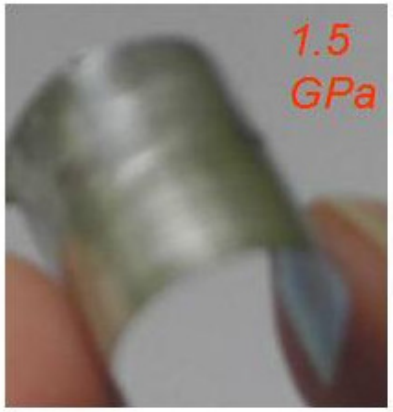
Flexible Polyamic Acid Membranes







Breimer MA, Yevgheny E., Sadik OA, Nano Lett., 2001, 1, 305

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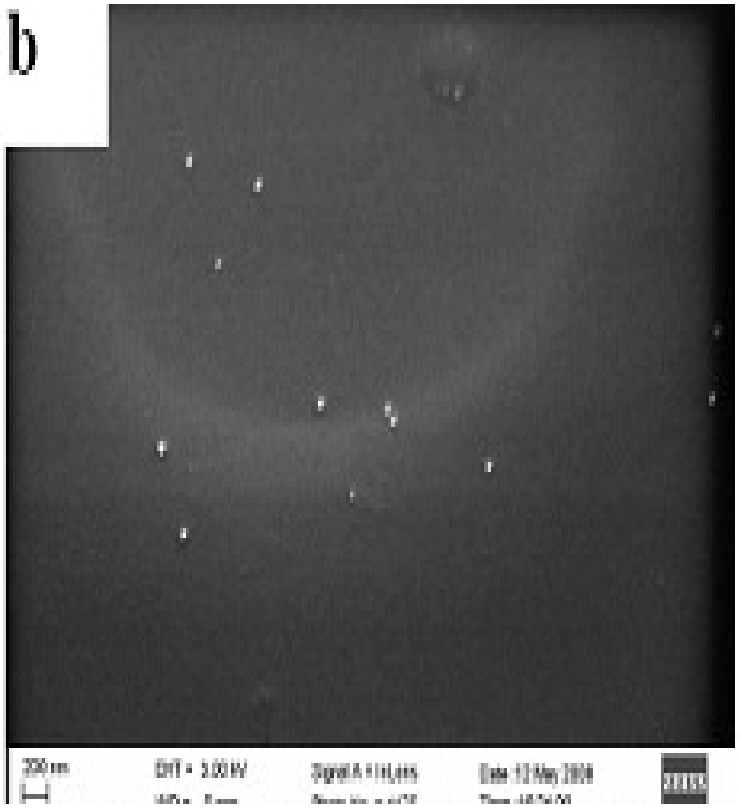
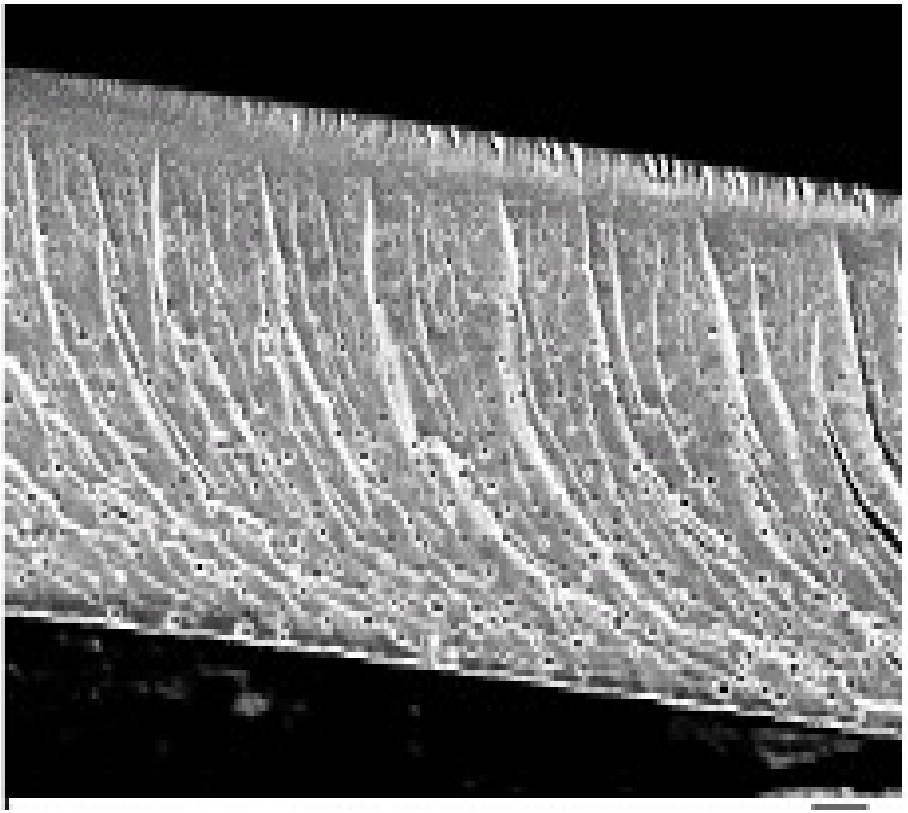
Phase-inverted membranes





Nian Du, Sadik et al, Flexible Nanoporous Membranes, Langmuir, 26(17) 14194-14202, **2010**.

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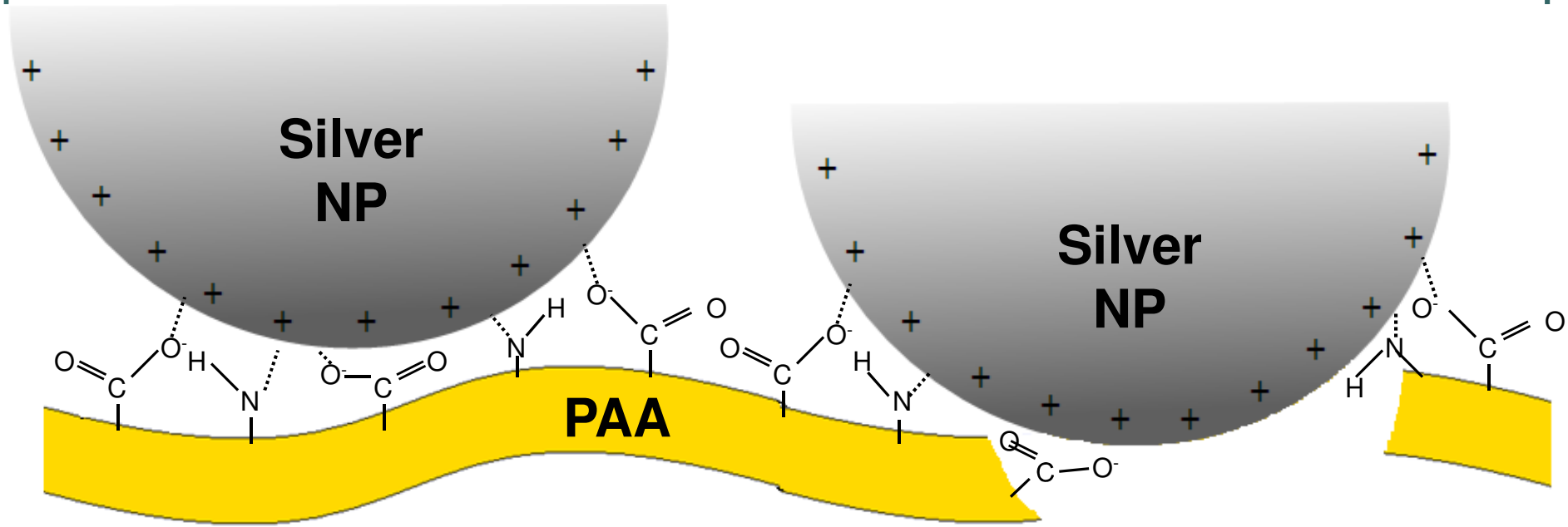
Mechanism for capturing silver NPs on PAA membranes



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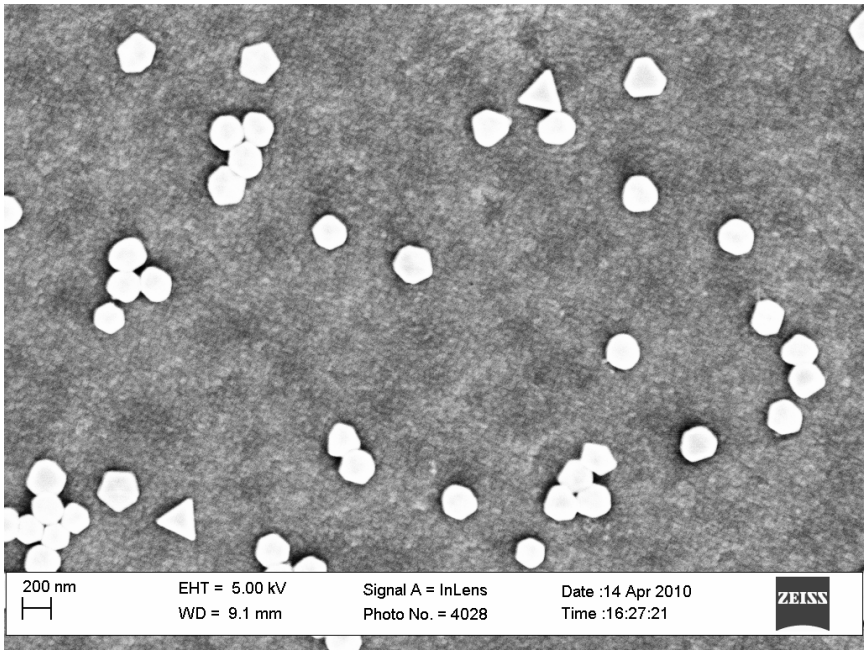
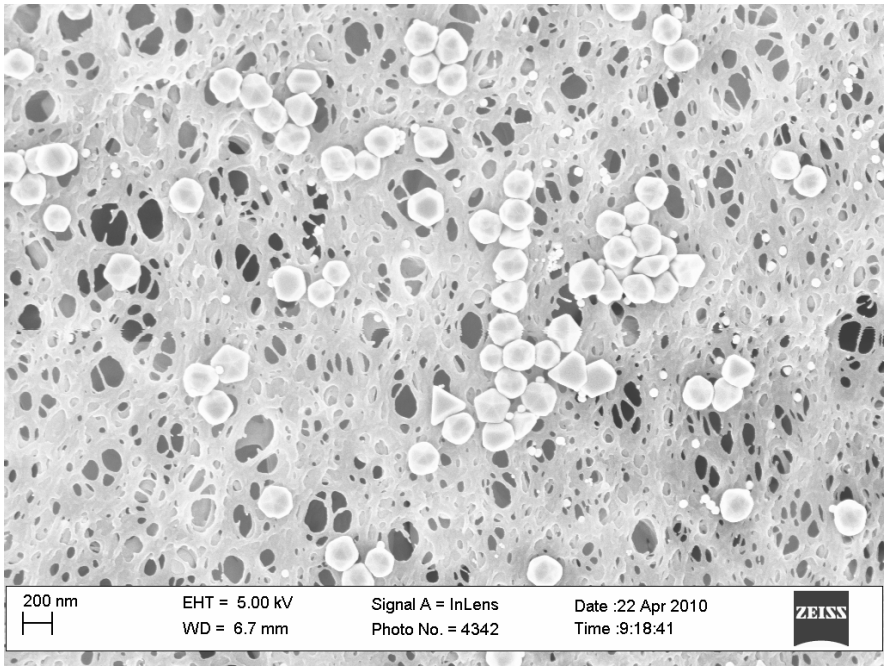
1st PAA membrane Layer

Standard



Continuous separation



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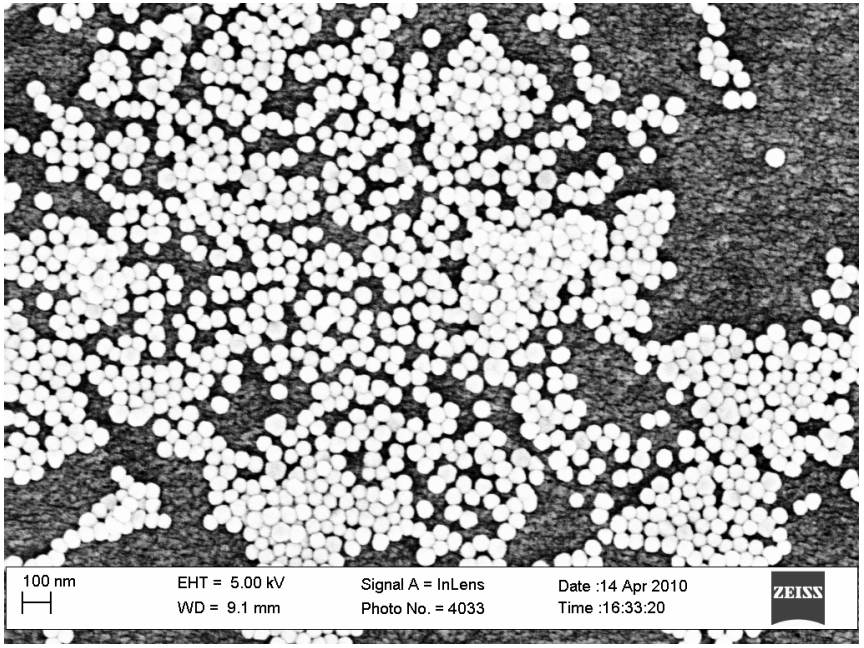
2nd PAA membrane Layer

Standard



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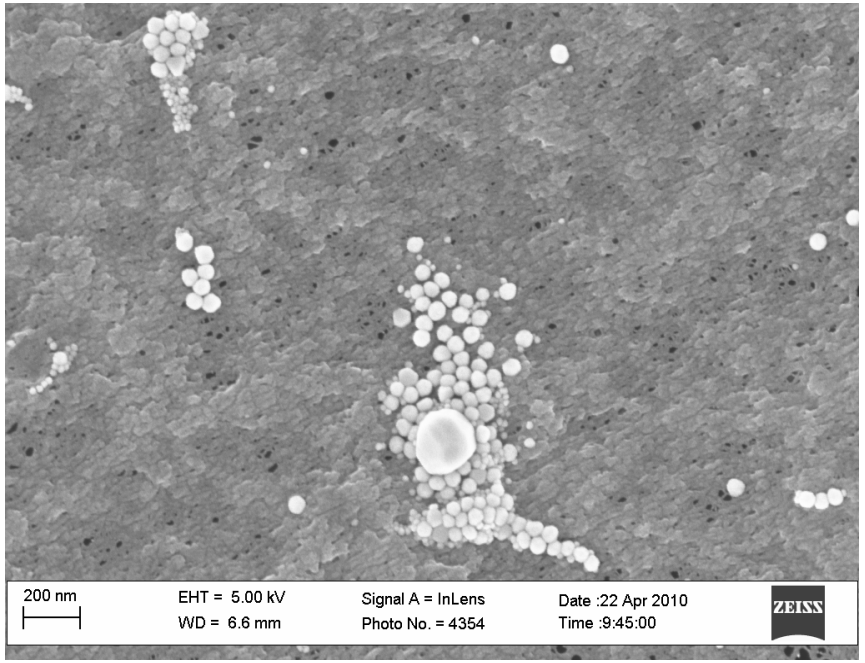

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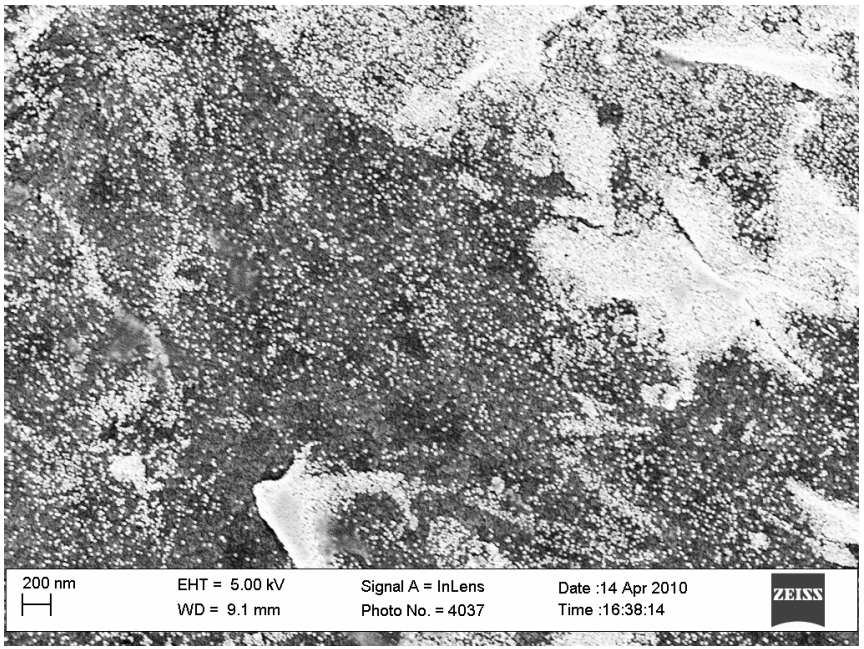
3rd PAA membrane Layer

Standard



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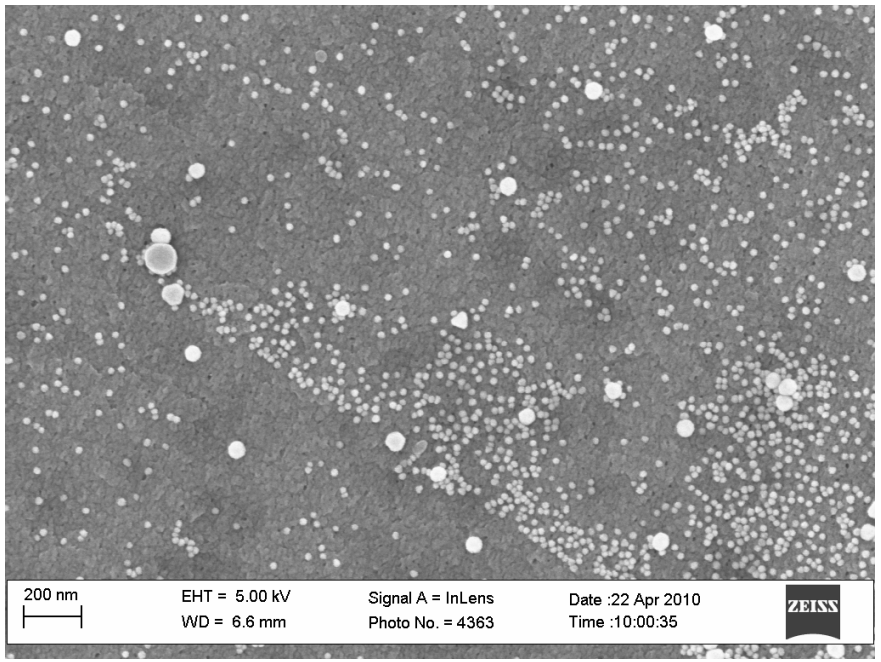

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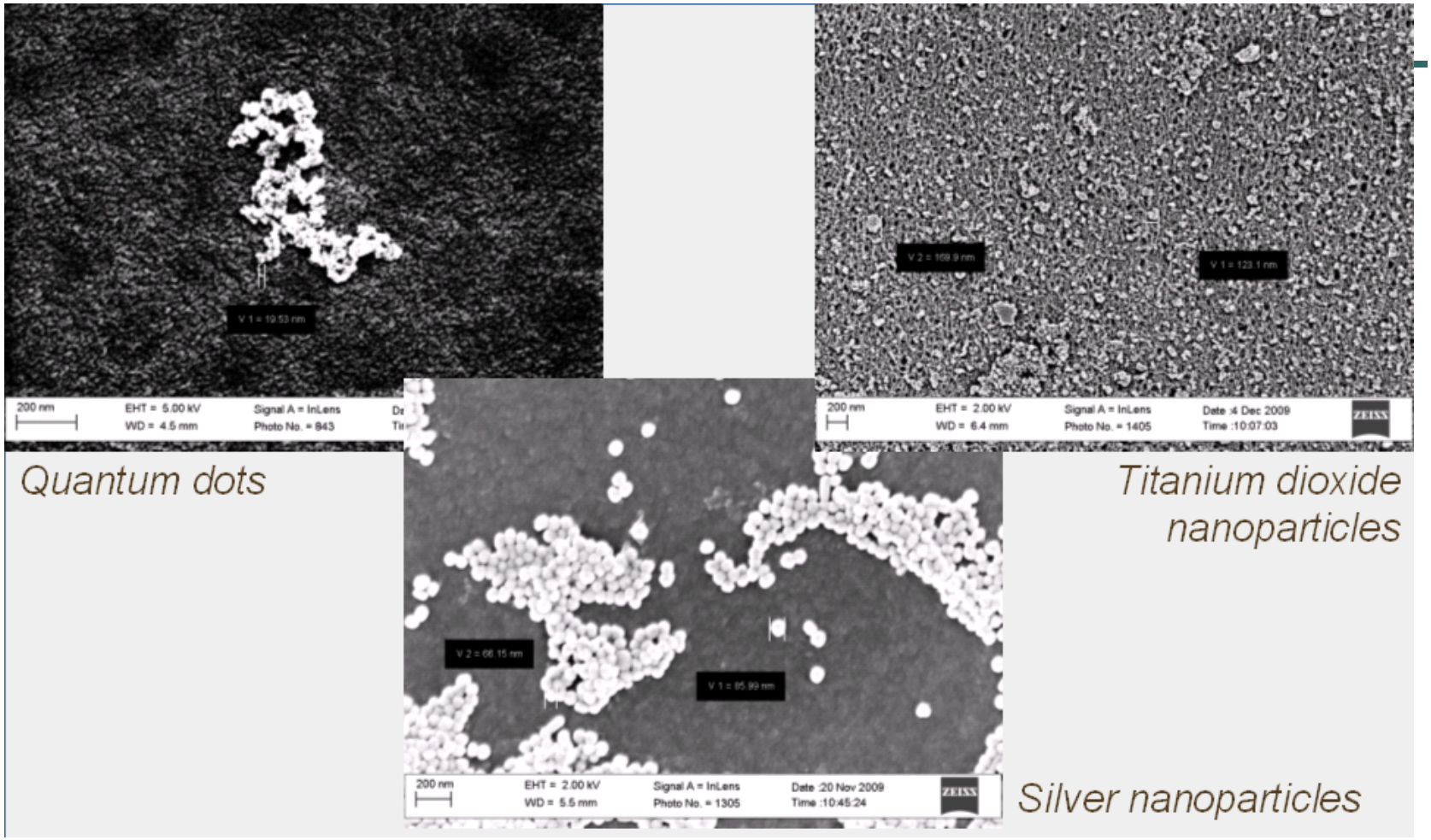
Classes of Nanomaterials



- Superior than Anodisc membranes
- Filtration efficiency reached 99.97%

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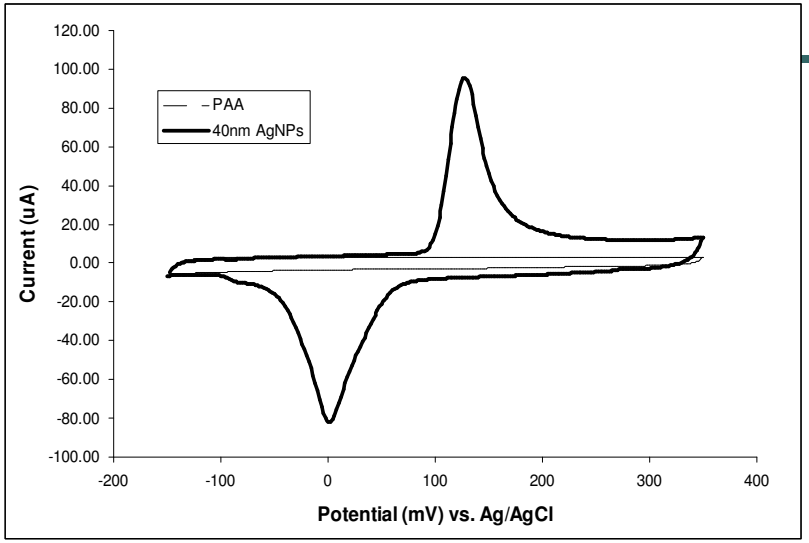
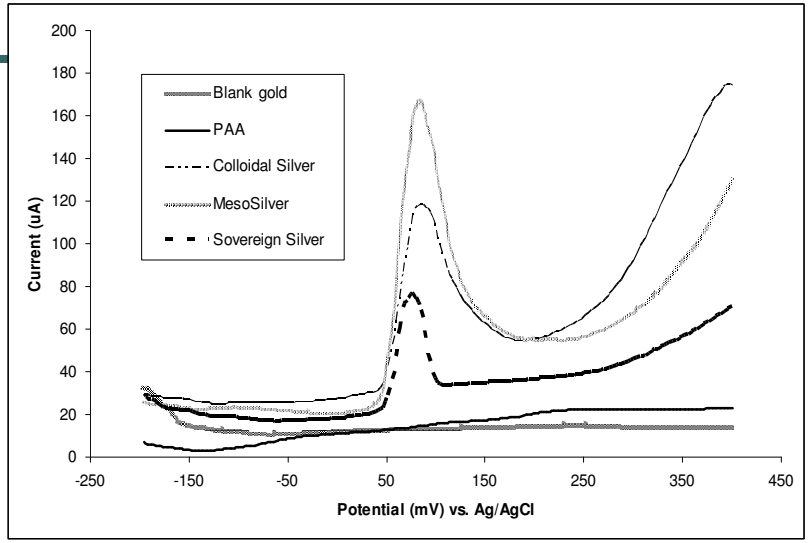
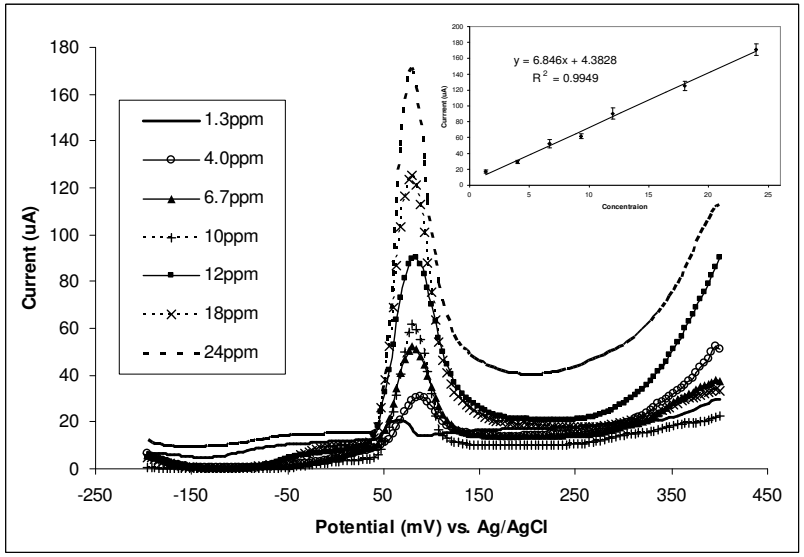
PAA membrane for detection of silver NPs







	Concentration determined by our method (ppm)	Concentration determined by AAS (ppm)*	Concentration reported by manufacturers (ppm)
Meso Silver	23.67	20.6	21.1
Colloidal Silver	16.64	16.9	35-40
Siveregion Silver	10.58	11.8	10

*AAS analysis was done with Rob Congdon

Summary and Outlook

•We are developing a portable nanoparticle analyzer based on poly(amic) acid mebranes. The instrument is equipped with nanoporous membrane electrode arrays that perform multiple functions:

- Isolates
- Captures
- Detects

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Defense Threat Reduction Agency
DTRALink

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