Draft overview of presentation, Gabriele Windgasse, September 12, 2012

Working Title:

**Exposure through the LifeCycle COR:  
Starting a Resource Tool for Analytical Methods for Engineered Nano Particles in Environmental Media**

**Intro** (topic-specific, short)

Given the multitude and diversity of ENP – how can we identify and quantify them in the environment throughout their life cycle? This paper wants to initiate a matrix of analytical methods that can be used for analyses of ENP in environmental media. This matrix will rely on input from the outside (wiki, crowd-sourcing) to be current and relevant.

**Goals** (cut them down?)

1. provide an ongoing relevant resource for ENP community for analytical methods
2. start and organize a list of analytical methods and tools for ENP in environmental media/compartments
3. provide a resource tool to be used in case of an unexpected release of ENP: how do we measure concentrations of different ENP in different media to enable exposure and health assessments? (in cooperation with and supporting other CORs)

**Proposed matrix**

Proposed matrix for organizing sources for analytical methods for ENP:

1. Regulatory Requirements or other official connection to analytical methods

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| **Organizational Level** | **Law/Rule** | **Title**  **Link to organization/information** | **ENP addressed** | **Number of analytical methods listed** | **Comments** |
| US - Federal |  |  |  |  |  |
| EPA | TSCA | <http://www.epa.gov/oppt/>nano/ | CNT, fullerenes |  |  |
|  | FIFRA | <http://www.epa.gov/pesticides/index.htm> |  |  |  |
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| US - State |  |  |  |  |  |
| CA - DTSC | voluntary | Information requested from manufacturers  <http://dtsc.ca.gov/TechnologyDevelopment/Nanotechnology/nanometalcallin.cfm>  Bibliography for analytical methods for these 6 ENP: <http://www.dtsc.ca.gov/TechnologyDevelopment/Nanotechnology/upload/Round_Two_Biblio.pdf> | nano silver, nano titanium dioxide, nano zerovalent iron, nano cerium oxide, quantum dots, and nano zinc oxide. | 100s  (79 pages) |  |
| CA - ARB |  |  |  |  |  |
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|  |  |  |  |  |  |
| EU - Federal |  |  |  |  |  |
| ECHA | REACH | “Scientific Technical Support on Assessment of Nanomaterials in REACH Registration dossiers and adequacy of available information” | Review of multiple registration dossiers with ENP; properties, toxicity, env. Fate/biodegradation, eco tox. | General discussion only | Workshop, May 30 – 31, 2012 |
| EC | Definition of ENP | “EU Definition of Nanomaterial – Potential Measurement Methodologies” | multiple | multiple | Review, May 2012 |
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| EU - Country |  |  |  |  |  |
| UK |  |  |  |  |  |
| Netherlands |  |  |  |  |  |
| Germany |  |  |  |  |  |
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| International Organizations |  |  |  |  |  |
| ISO |  |  |  |  |  |
| ASTM |  |  |  |  |  |
| CEN (?) |  |  |  |  |  |
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1. Industry/Commercial sources of analytical methods

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| **Organizational Level** |  | **Title**  **Link to organization/information** | **ENP addressed** | **Number of analytical methods listed** | **Comments** |
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| BASF |  |  |  |  |  |
| INNO:CNT |  |  |  |  |  |
| NanoPolytox |  |  |  |  |  |
| Duke/CEIN |  |  |  |  |  |
|  |  |  |  |  |  |
| NEPHH |  |  |  |  |  |
| PerkinElmer |  | Chart: Nanomaterials characteristics and applicable analytical technologies | multiple | multiple |  |
| NanoSight |  |  | Multiple, in liquid suspension |  |  |
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1. Non-profit/university research/published literature for analytical methods

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| **Organizational Level** |  | **Author/Title Link to article** | **ENP addressed** | **Number of analytical methods listed** |  |
| National Academy of Sciences |  | A Research Strategy for Environmental, Health and Safety Aspects of Engineered Nanomaterials | multiple | Overview only |  |
|  |  | CNR Rao, K Biswas (2009), Characterization of Nanomaterials by Physical Methods. Annual Review of Analytical Chemistry. Vol.2: 435-462 |  |  |  |
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**Future goals:**

1. Develop a flowchart: how to analyze for an unknown ENP in soil, water and air
2. Develop criteria for Standard Operating Procedures (SOP) for analytical methods.   
   (What parameters to analyze: surface area/g, size, chemical composition, chemical composition/charge of surface; shape; aggregated or single particle; presence of “impurities”; absorption/emission spectrum in which section of the electro-magnetic spectrum, what other physical or chemical characteristics, or combination thereof?)
3. Identify data gaps:
   1. How to account for aggregated ENP?
   2. for which ENP we do not have analytical methods?
   3. Where are ENP located throughout their lifecyle (GIS analysis, location of major production and storage facilities).   
      How many people are exposed to which ENP in which environmental media and at what concentrations (occupationally, general population, sensitive sub-population)?
   4. What are the toxicities of ENP throughout their lifecycle? (Cooperation with other CORs)

**Conclusions/Recommendations**

Multiple analytical techniques may be necessary to identify and quantify a single ENP in an environmental media.

Fill in the blank spaces in the matrix: best way to do this may be online (wiki?) so others may add to it- who will maintain/host/oversee?

Documents needs to be up-to date if we want this work to have impact in the long term

Prioritize with data gaps and goals to target next.

Suggestion: if we can find an economic advantage that is associated with the identification and quantification of ENP in the environmental media and not only with finding and producing ENP for exciting and lucrative new uses – it would make our work much easier. Product liability in US? Establish a NanoFund to address uncertainties associated with the new materials and their uses, breakdown-products etc. ?

**References**

**Contacts**