ACC Nanotechnology Panel
Engineered Nanomaterials Survey

Summary Discussion
September 2007

Introduction: This survey of the ACC Nanotechnology Panel was conducted to obtain information on work practices that are currently being employed to manage potential risks arising from engineered nanomaterials (ENM). A summary of the survey results and discussion follows.

1. The ACC Nanotechnology Panel Survey on Engineered Nanomaterials is different from the ICON and ORC Worldwide surveys.

   - There have been at least three efforts to gather information on best practices for handling engineering nanomaterials: the International Council on Nanotechnology (ICON) *A Survey of Current Practices in the Nanotechnology Workplace*, the ACC Nanotechnology Panel, and ORC Worldwide's Nanotechnology Task Force's *Matrix of Nanotechnology Safe Practices*. Each of these efforts used different methodologies and had a different focus. The ICON effort cuts across academic, government, and industry sectors and includes a cataloging of practices organized by sector. The ACC Nanotechnology Panel survey reports on industry practices only among current members of the Nanotechnology Panel and provides a summary of the industry practices. The ORC Worldwide's effort attempts to gather practical tools for the workplace and makes these tools available to all. Each of these efforts has contributed to expanding the current state of knowledge regarding work practices pertinent to nanotechnology.

   - The ICON Survey evaluated published literature and gathered information through direct interviews with individuals and groups from companies manufacturing and/or using nanomaterials. The ICON methodology involved interviews with representatives from government and academic laboratories. The ICON survey also includes workplace practices, health and environmental safety information, and information about risk assessment practices. The product from the ICON Survey is a report cataloging current practices by commercial sector, size, and geography, which can be accessed at http://icon.rice.edu/projects.cfm?doc_id=4388.

- The ORC effort drew information from industry and government agencies and gathered practical tools that can be reapplied by companies as needed. The information was offered voluntarily by participating companies, peer reviewed, and published. The product of the ORC effort is a table identifying categories of workplace risks and tools to evaluate and manage those risks. This is an ongoing effort with many areas still under development. The table is available at http://www.orc-dc.com/Nano.Guidelines.Matrix.htm.

- The ACC Nanotechnology Panel survey information was collected through a written survey tool and focused on current practices employed by ACC Nanotechnology Panel member companies. In addition to workplace practices, the survey collected information on potential exposures by categorizing throughput volume and estimates of releases.

2. For every question, there are a variety of answers that indicate the diversity within the "industry" as defined by the ACC Nanotechnology Panel membership. It is not possible to generalize statements about many aspects of the industry, but common themes are indicated. For example, all responders have engineering controls in place for Engineered Nanomaterials (ENM); all such controls are informed by information specific to ENMs hazards; personal protective equipment use is common; and releases of nanomaterials are uniformly low. For example, approximately 70% of Panel members participated in the Survey, and all but one participant reported that they have specific personal protective equipment (PPE) programs in place for ENMs. The one company that responded that it did not address ENM issues specifically reported that it addresses them through a hazard analysis, which likely yields similar, if not identical, results.

3. An important observation based on the Panel survey is that there are relatively few identified manufacturing operations that currently operate that could result in potential employee exposures to ENMs. Potential exposures may occur during episodic events such as product sampling from closed processes or during maintenance operations when exposure control measures are in place.

4. Nomenclature and terminology related to nanomaterials is a key issue as evidenced by the survey answers. The Survey respondents were asked to use the NNI definition, but half of the members responding developed their own definition. While similar in nature, these definitions do not necessarily conform to the consensus standards being developed by national and international standards-setting organizations. They vary in the number of dimensions considered, physical state or other properties such as solubility. As a result of this diversity, the Panel developed a discussion paper "Consideration for a Definition for Engineered Nanomaterials" which is available at: www.americanchemistry.com/nanotechnology.

5. In general, companies reported exposure control programs are in place for nanomaterials handling. The operations that involve potential exposures are well understood, and include a range of controls including PPE. The survey responses clearly reflect that the

PPE practices depend on the specific facts of the situation; for example, increased respiratory PPE protection may be applicable for work outside a fume hood, while less stringent protection may be applied for ENM contained in a solution or an aggregate.

6. Releases to the environment for nanomaterials are reported to be controlled and very small. The vast majority of survey participants reported zero or non-detectable releases of ENMs into the environment.

7. Manufacturing locations are few in number. Most respondents to the survey reported manufacturing, using or processing nanomaterials at fewer than 5 sites.

8. The fourteen companies responding to the survey are large companies in terms of manufacturing and processing of nanomaterials into products. Conversely, the suppliers of primary nanomaterials vary greatly in company size, number of employees, number of products, volume of each individual product(s), and EHS experience level of the company and its employees. Defining the "industry" for nanotechnology is difficult due to this diversity and number of small businesses involved.