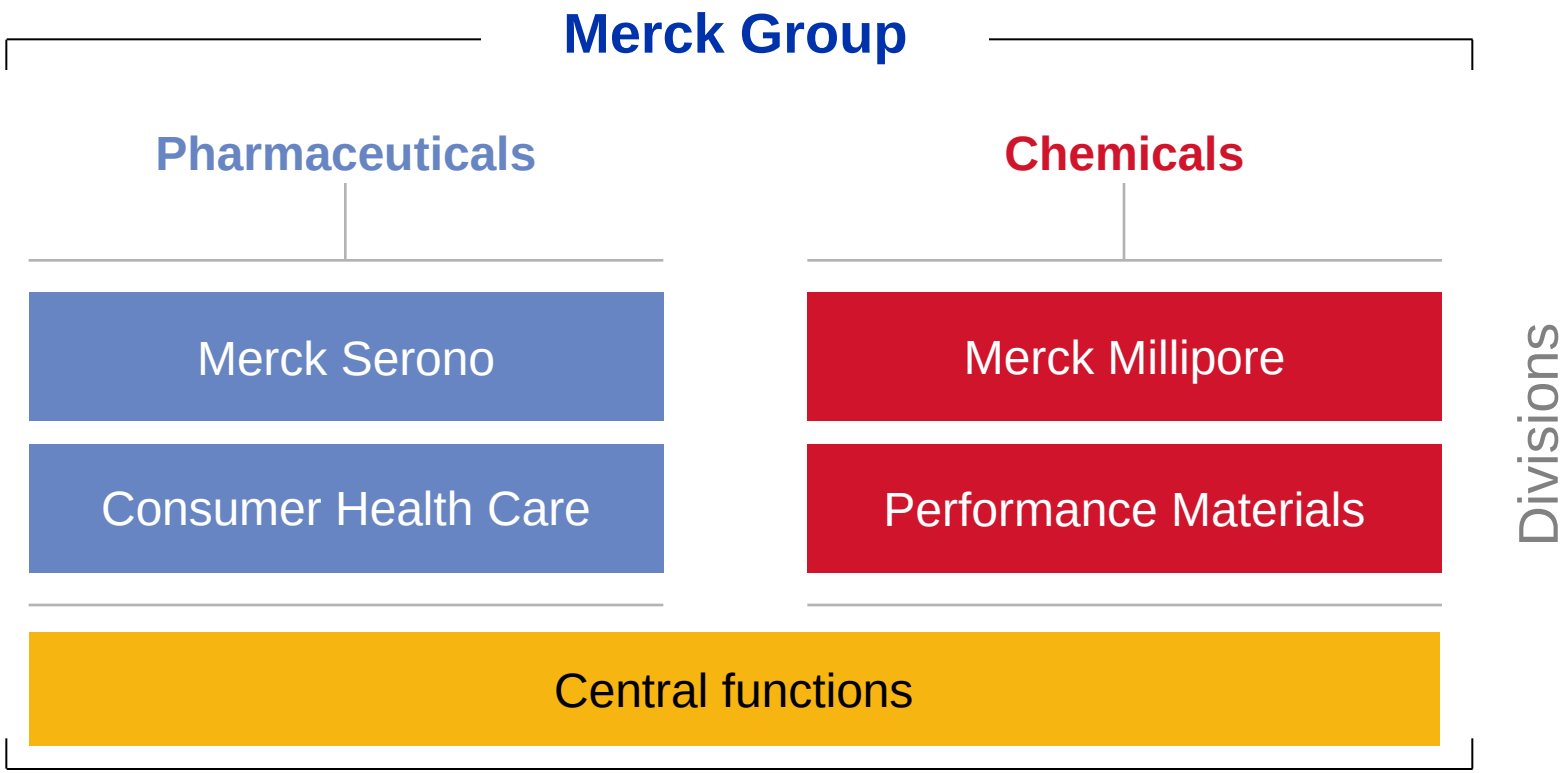
Opportunities for Improving US Role in Global Supply Chain

Michele Ricks / San Jose, CA / June 14, 2012

Disclaimer: "All references to “Merck” refer to Merck KGaA, Darmstadt, Germany. In North America Merck operates under the name EMD."

Corporate Structure



Performance Materials – New Business Items

Displays

- Latest development: PS-VA technology[1]
- 3D applications
- Flexible displays
- OLED materials

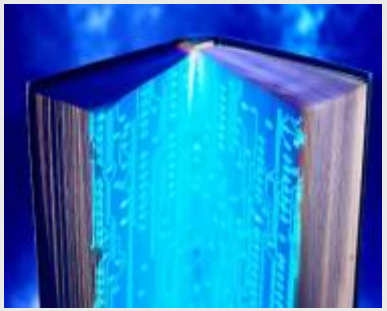
Photovoltaics

- Structuring and process chemicals
- Materials for thin organic solar cells
- Ionic liquids for dye-sensitized solar cells
- Anti-reflex coatings

Lighting

- OLEDs for lighting applications
- Lighting materials (phosphors) for LEDs

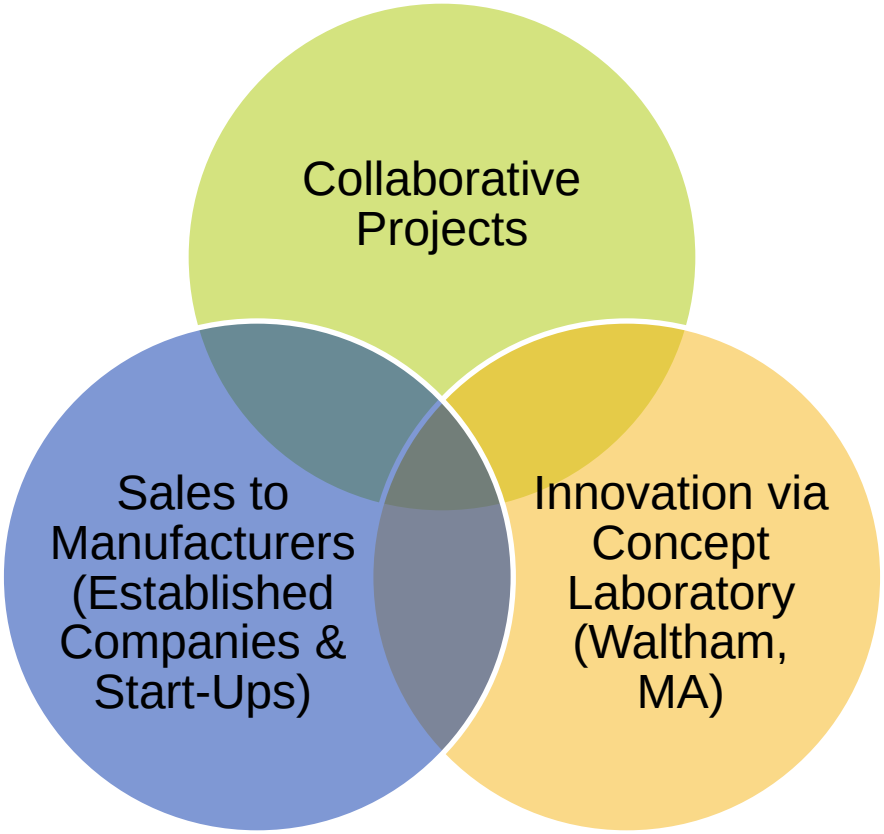
Printable Electronics



- Organic electronics
- Inorganic semiconductors

[1] PS-VA: Polymer-Stabilized Vertical Alignment

EMD-PM Activities in the US



Some Challenges for the Chemical Sciences

- Integration of research and teaching
- Demonstrated value of research to society
- Return on investment
- Feedback between the chemical industry and university research
- The effects of university research on industrial competitiveness, maintaining a technical workforce and developing new industrial growth

Source: Challenges for the Chemical Sciences in the 21st Century, Materials Science & Technology,
National Research Council of the National Academies

Encouraging Collaborative Projects & Start-Ups in the US

Collaborative Projects

- Provide tax incentives for US-based innovation
  - Provision of incentives for the purchase of high-tech research & manufacturing equipment
  - Incentives for long-term investments in innovations (may stimulate VCs)
  - Changes in overall corporate tax rates
- Increase number of NSF graduate fellowships in relevant research areas
  - Could consider cost-sharing of the fellowship between the government and company, to drive collaboration between universities and companies

Source: Rising Above the Gathering Storm,
National Academy of Sciences, National Academy of Engineering and Institute of Medicine

Developments in Solution-Based Processing

Vapor -based OLEDs

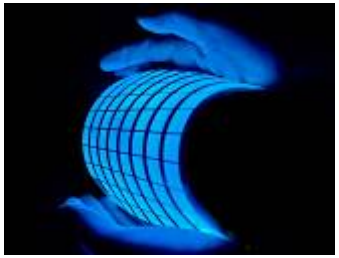
already in mass production

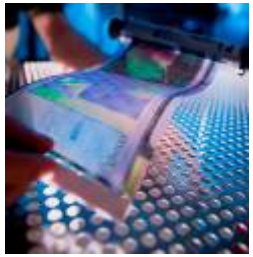
- **complexity is distributed between materials and stack architecture**
- **Evaporation process technology has made great progress**

Solution-Based OLEDs

offer the potential for

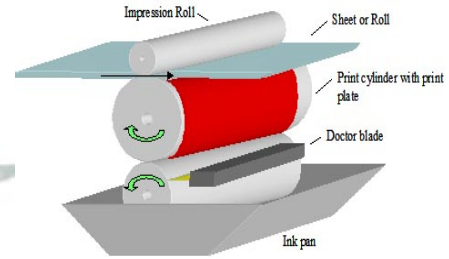
- **greater ease of processing**
- **reduced manufacturing costs**
- **very large area application**
- **R2R printed displays and lighting**

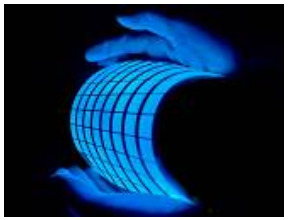




- Recent material improvements in efficiency and lifetime need to be translated to the various solution process technologies
- The DOE should continue to fund developments in solution-based processing of OLEDs

Active Co-Development with Partners for Best Results in Printing Performance





Materials → Printable Formulation → OLED Device Process → End-Device Process → Application

Merck sales | Co-Development | Customer

Business model

Development expertise

Summary

- There are many opportunities to expand the role of the US in the global supply chain for SSL
- Collaborative projects between equipment makers and material makers, between industry and universities, is one approach to further technology development
- Fostering start-ups
  - DOE-funded projects
  - Providing incentives for long-term investment in innovation
- Funding low-cost manufacturing strategies, to enable local manufacturing

The DOE should continue to encourage and support such projects!

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