OREGON NANOSCIENCE AND MICROTECHNOLOGIES INSTITUTE

Panel:

High Performance Nanomaterials for Electronic and Industrial Applications

Nanomanufacturing Summit 2011

September 26, 2011

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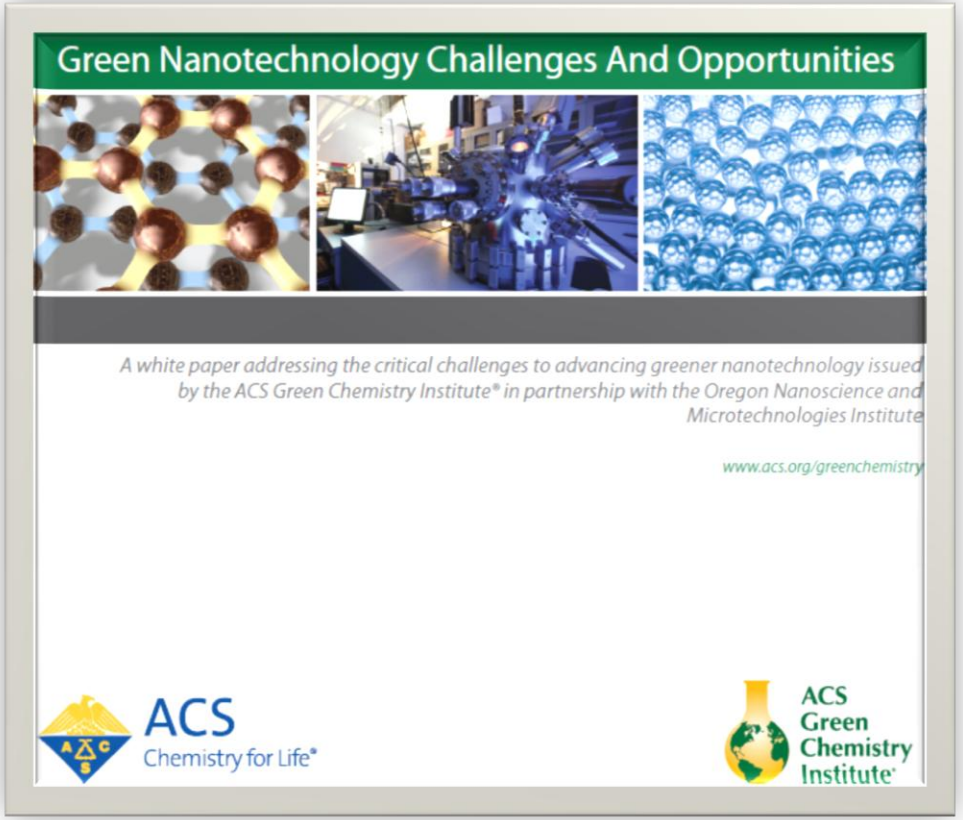
What We Mean by "Green" Nanomaterials"

- **Earth abundant and non-toxic materials,**
- **Reduced material waste**
- **Reduced energy and water use**
- **Lower cost**
- ***Better* performance (required by customers)**



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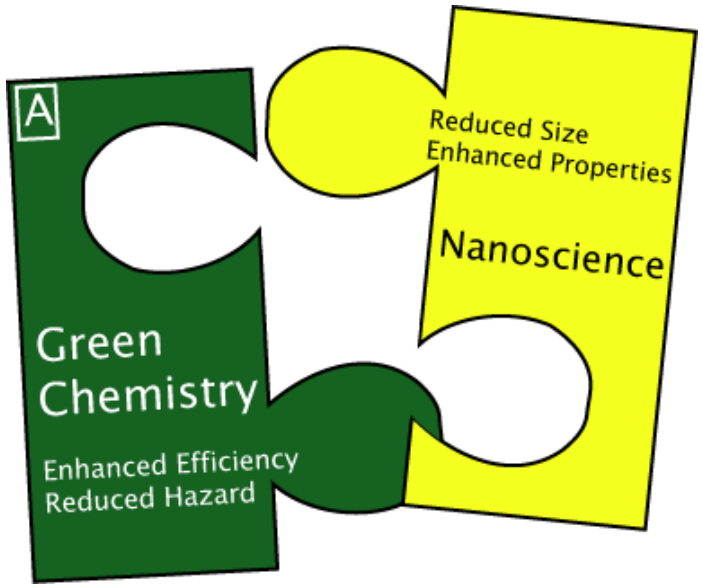
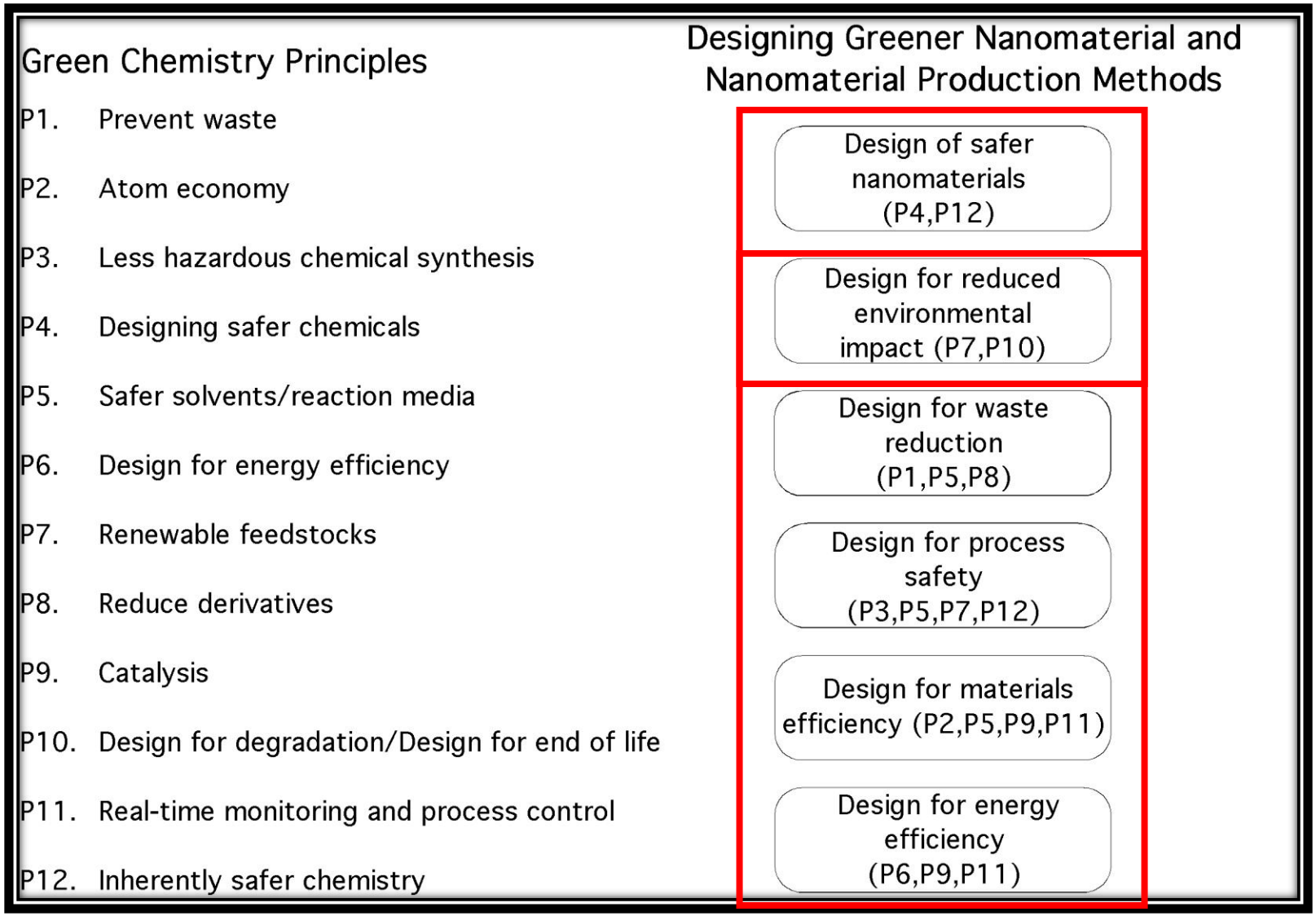
Applying green chemistry to nanomaterials and nanomanufacturing



Higher performance
Cheaper
More convenient
Greener

McKenzie and Hutchison "Green nanoscience," *Chemistry Today,* **2004**, 30.
Dahl, Maddux and Hutchison "Toward Greener Nanosynthesis,"
*Chem. Rev.***2007**, *107*, 2228.

Principles for greener nanoscience



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Dahl, J.A.; Maddux, B. L. S.; Hutchison, J. E. *Chem. Rev.* **2007**, *107,* 2228

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Example Applications

- **Semiconductor (Si and compound) films**
- **Display backplane and PV process films**
- **High-performance nanolithography and EUV resists**
- **Anti-reflective, thermal insulation and other functional coatings**

A Green Nano Startup Portfolio

SNNI	Green Nano-Material	Green Nano-Manufacture	Green Nano Application
Safer Design	DUNE SCIENCES		
Reduce e-impact	Crystal Clear Technologies		PERPETUA Power Source Technologies
Waste Reduction		VOXTEL NANO	ZAPS TECHNOLOGIES
Process Safety		CSD Nano Inc	
Materials Efficiency		inpria	PLT
Energy/H2O Efficiency			Puralytics

The Panelists:

Doug Keszler, Founder/CSO of Inpria Corp., Distinguished Professor of Chemistry; Oregon State University; Director, Center for Sustainable Materials Chemistry (NSF CCI)

David C. Johnson, Rosaria Haugland Foundation Chair in Pure & Applied Chemistry, University of Oregon; Co-Director, Center for Sustainable Materials Chemistry

Judy Giordan, Partner, ecosVC; CSMC Innovation Program

Skip Rung, President & Executive Director, ONAMI (Moderator)