Replacement of Critical Materials

A multidisciplinary topic to be considered as an Oklahoma NSF/EPSCOR Proposal

Critical Materials

- Required for essential economic uses
- Uncertain supply or availability
  - ✓ Technological limitations
  - ✓ Political / geographical conditions
  - ✓ Economical issues

Examples:

- Rare Earth Elements
- Tellurium
- Lithium
- Precious metals
- Indium / Gallium

Application of Critical Materials

These materials are used in:

- Oil refining
  (gasoline and diesel fuels)
- Batteries
- Solar cells
- Lasers
- Touch-screen displays
- Cell phones
- Computers
- Magnets (wind turbines)
- Electric cars
- Fertilizers

Research Funding Opportunities

National Science Foundation

- Materials Genome Initiative for Global Competitiveness

  Designing Materials to Revolutionize and Engineer our Future

- Division of Chemistry

Two out of four goals of the Division:

  - Exploring earth-abundant, inexpensive and benign alternatives to rare, expensive and toxic chemicals. Examples: In, Ge, rare earth elements and Pt metals.
  - Developing efficient recognition/sequestration and recycling of key elements essential for sustainability, for example P and rare earths.

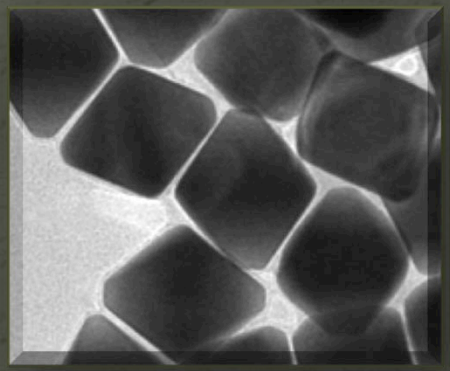
Department of Energy

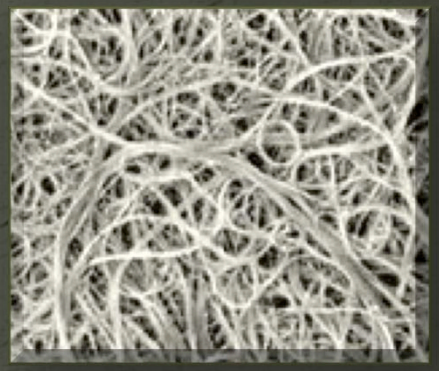
- *Critical Materials Strategy*

  Clean energy technologies, including wind turbines, electric vehicles, photovoltaic cells and fluorescent lighting, use materials at risk of supply disruptions in the short term.

Why us ?

Relevant research experience in Oklahoma

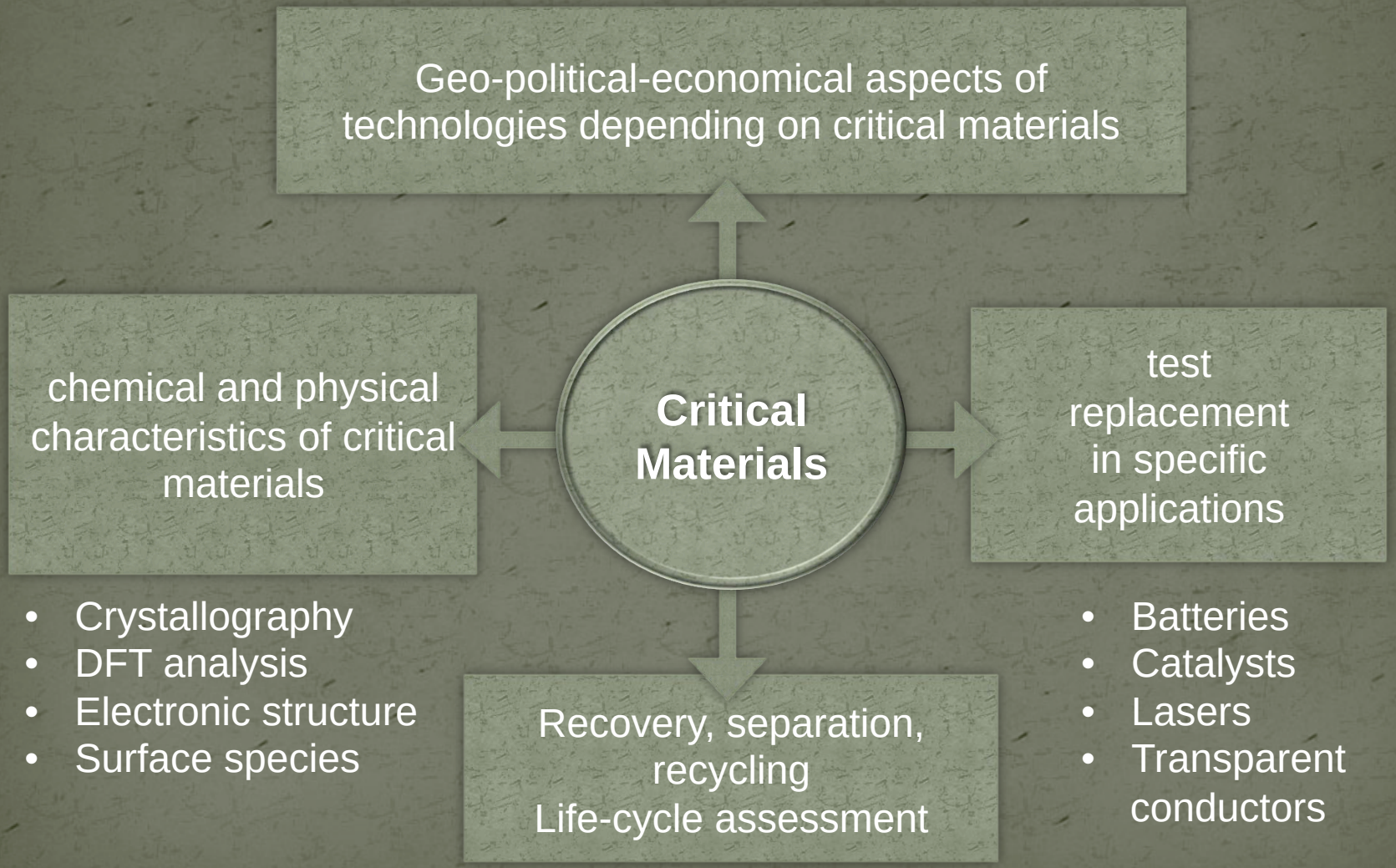




- Catalysis
- Electronics
- Lasers
- Materials Science
- Inorganic chemistry
- Batteries
- Ceramics
- Materials characterization
- Separation processes

- Nanotubes
- Geology
- Geological Survey
- Life-cycle assessment
- Global economics

Research Opportunities



- Crystallography
- DFT analysis
- Electronic structure
- Surface species

- Batteries
- Catalysts
- Lasers
- Transparent conductors

Participants

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- Dale Teeters (U. Tulsa – Chemistry)
- Robert Houser (Chemistry)
- CCEW OU – Daniel Pullin et al.