

# Carbon-Negative & Dollar-Positive



**GLOBAL CO<sub>2</sub> INITIATIVE**  
UNIVERSITY OF MICHIGAN

What and How?

## Vision and Mission



**VISION:** Identify and pursue *commercially sustainable approaches* that reduce atmospheric CO<sub>2</sub> levels by 4Gt/year.

**MISSION:** Transform CO<sub>2</sub> into commercially successful products using an accelerating system-level process of *technology assessment, technology development, and commercialization*, accomplished through convening and downstream promotion in partnership with entities around the world.

## Turning CO<sub>2</sub> into profitable products at UM



Organization

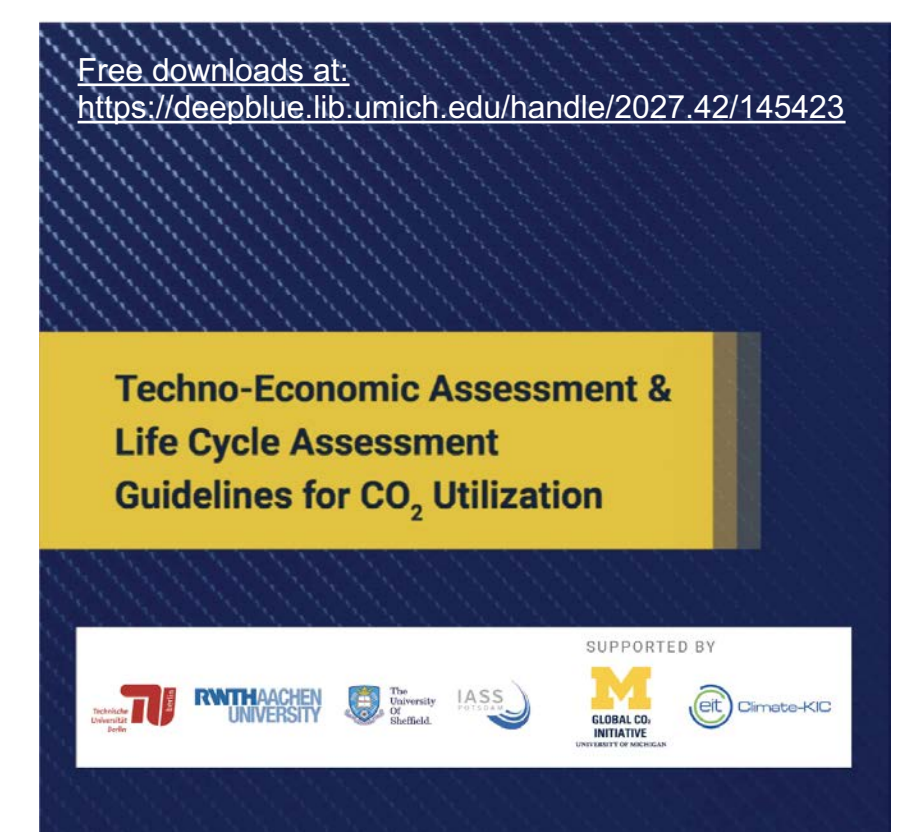
## Components of the Initiative



## Pillars of Activity



- Global harmonization of Techno-Economic Assessment (TEA) and Life Cycle Assessment (LCA) for CO<sub>2</sub>-based products
- Market analysis of the prospects for CO<sub>2</sub>-based products
- Funding and conducting research on CO<sub>2</sub>-based products at all technology readiness levels and translation into the marketplace



Research Projects (Selection)

### Flexible concrete holds 30% CO<sub>2</sub> by weight



- Flexible concrete: Engineered Cementitious Composite (ECC)
  - 40% emissions reduction for base ECC (lifetime benefits) and 50-80% reduction for carbon-sequestering ECC
  - Commercialization path and funding underway

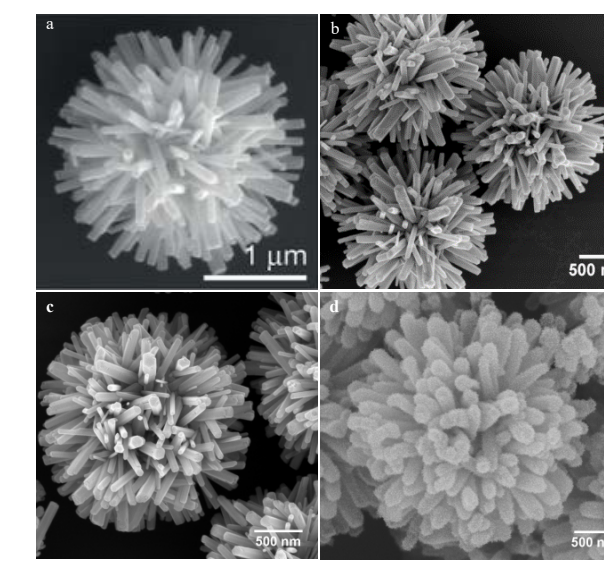


Professor Victor Li, Civil and Environmental Engineering

### Fuels and base chemicals



- Reduction of supercritical CO<sub>2</sub> with biomimetic hedgehog particles
- sCO<sub>2</sub> helps dissolve new type of catalyst, increase volumetric efficiency of reaction

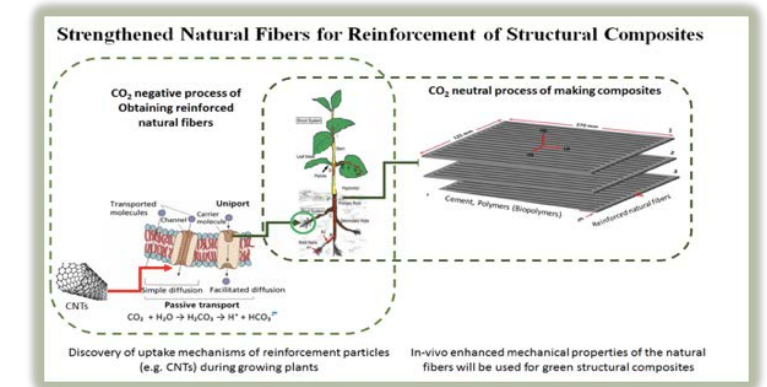


Professor Nicholas Kotov, Chemical Engineering

### Stronger natural fibers for composites



- Reinforcement of Structural Composites
- Integrate nano-particulates in plants

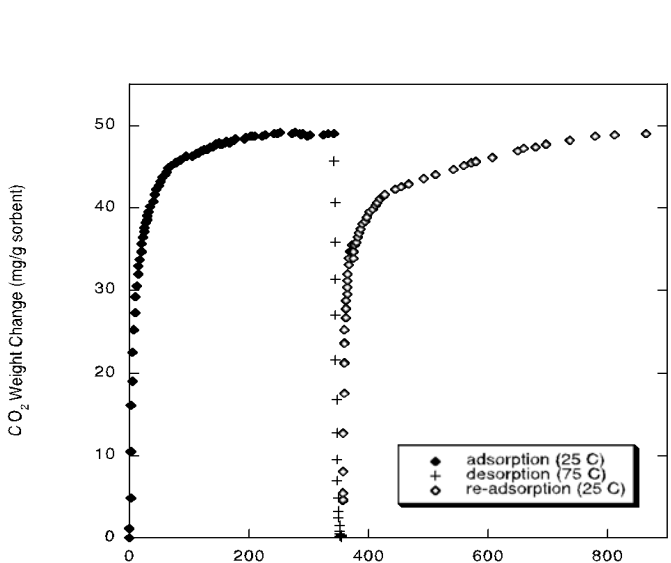


Professor Alan Taub, Material Science & Engineering, and Research Associate Professor Miki Banu, Mechanical Engineering

### Better Sorbents for CO<sub>2</sub> Capture



- Superior CO<sub>2</sub> adsorbents, replacing industry-standard
- Build through targeted enhancements



Professor Ralph Yang, Chemical Engineering

### Assessment of CO<sub>2</sub>-based Products



- Life Cycle Assessments (LCA)
- Techno-Economic Assessments (TEA)
- Determine, if a product is
  - Carbon Negative
  - Dollar Positive
- Advancing LCA/TEA guidelines



Prof. Shelle Miller, Professor G. Keoleian, SEAS; Prof. P. Stryling, Sheffield; Prof. O. Renn, IASS Potsdam; Prof. R. Schomäcker, TU Berlin; Prof. A. Bardow, RWTH Aachen

### Human resources development



- Accelerator class built on Techlab @ Mcity model
- Projects with Erb Institute, Ford School of Public Policy, and other programs



Dr. Jonathan Fay, Center for Entrepreneurship

Team and Partners

## Our Internal Team & Network



- College of Engineering (CoE)
- University of Michigan Energy Institute (UMEI)
- School of Environment and Sustainability (SEAS)
- Center for Sustainable Systems
- Graham Environmental Sustainability Institute (GESI)
- Erb Institute
- UM Smart Infrastructure Finance
- Business Engagement Center (BEC)
- Office of University Development (OUD)
- Ford School of Public Policy (SPP)
- College of Literature, Science, and the Arts (LSA)
- Taubman College of Architecture and Urban Planning (TCAUP)
- Institute for Social Research (ISR)
- University of Michigan Carbon Neutrality Commission



## Our Expanding External Network



Some very generous individuals!

Coordinating efforts and exploring partnerships: Columbia University, Energy Futures Initiative, Carbon180, New Carbon Economy Consortium, Corporations, others

FOR MORE INFORMATION ON UPCOMING ANNOUNCEMENTS OR TO LEARN ABOUT OPPORTUNITIES TO PARTNER & COLLABORATE:

- info@globalco2initiative.org
- globalco2initiative.org
- @reuseco2
- Global CO<sub>2</sub> Initiative

Join our growing global network as we develop and deploy critical carbon management technologies and solutions to meet the challenges and opportunities ahead.

Volker Sick, Global CO<sub>2</sub> Initiative, Director  
Arthur F. Thurnau Professor, Mechanical Engineering, DTE Energy Professor of Advanced Energy Research, University of Michigan

