



# Green Technology and Resource Recovery Laboratory



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Establishing a recycling-oriented society toward sustainability will, in many cases, require novel waste treatment and recycling technologies to alter their practices. Due to the progress in development of new recyclable materials, green design, and energy conversion technologies, the recycling of organic and/or inorganic wastes has become the focus and direction of this lab, applying processes such as composting, combustion, pyrolysis, gasification, sintering and melting techniques. Other than the important and highly developed area such as studies on urban mass and energy flow, development of environmental friendly materials, as well as the carbon dioxide capture by accelerated carbonation technology. This lab also emphasizes on development of energy-saving processes using autoclaving (hydrothermal reaction) and environment-friendly technologies

## Research highlight

### Waste-to-energy

- Waste-to-syngas technology (gasification)
- Waste-to-biooil technology (pyrolysis)
- Enhanced energy conversion by innovative conversion techniques
- Syngas clean-up by an innovative hot gas cleaning system
- Syngas clean-up by an innovative mixed matrix membranes (MMMs)

### Waste-to-material

- Green building material produced from nonhazardous sludge/ wastes
- Green lightweight material produced from wastes
- Innovative antibacterial lightweight material development
- Agricultural residues derived valuable products: inorganic filler on mixed matrix membranes (MMMs), biochar for soil metal adsorption
- Extraction of Cellulose nanocrystal (CNC) from cotton cloth waste

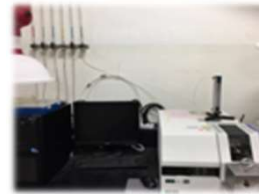
### CO<sub>2</sub> capture & MSWI Fly Ash Stabilization

- CO<sub>2</sub> capture by accelerated carbonation technique
- CO<sub>2</sub> capture by CNC-Silica hybrid aerogel
- MSWI fly ash stabilization and heavy metal partitioning
- MSWI fly ash detoxification and resourcification by thermite

### Innovative catalyst preparation

### Life cycle assessment (LCA)

### Environmental impact assessment (EIA)



Thermogravimetric analysis



Gas chromatography



Ion Chromatography



Elemental Analyzer



Fourier-transform infrared spectroscopy



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## Recent research

- Morphological evolution of a 3D flower-like Hierarchical Co(OH)<sub>2</sub>/Ni(OH)<sub>2</sub> and CoLDH on V<sub>2</sub>O<sub>5</sub> for highly stable energy storage Supercapacitors
- Synthesis and CO<sub>2</sub> adsorption efficiency of polyethyleneimine-modified cellulose nanocrystal/ silica hybrid aerogel
- Development of biogenic filler of Pebax mixed matrix membranes for CO<sub>2</sub> separation
- Optimum eco-friendly extraction of terephthalic acid (H<sub>2</sub>BDC) derived from PET waste using the response surface methodology