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5. Evaluation of GHG reduction and economic feasibility of converting campus waste into renewable energy at the University of Cincinnati (UC): waste cooking oil-to-biodiesel, waste paper-to-fuel pellets, and food waste-to biogas
6. Implications of biodiesel production on water resources in the US (funded by *US EPA*)
  - Comprehensive review and analysis of the water consumption and wastewater generation involved in feedstock growth and manufacturing processes of biodiesel production in the US.
- Experiment design and process simulation
  1. Utilization of the trap grease for biodiesel production (funded by *US EPA P3 grant: SU835291*)
    - Develop novel extraction and conversion technologies for utilizing trap grease as the feedstock for biodiesel production, such as hydrothermal liquefaction for biocrude
  2. Glycerolysis as a pretreatment technology for the oil derived from trap grease for biodiesel production (funded by *US EPA P3 grant: SU835291*)
    - Process simulation of glycerolysis as a high FFA oil pretreatment step in ChemCAD®
    - Use the “GREENSCOPE” tool developed by US EPA to assess the sustainability of the glycerolysis process
  3. Beneficial reuse of waste coffee grounds (WCGs) for biodiesel production
    - Develop novel extraction and conversion technologies for utilizing WCGs as the feedstock for biodiesel production
    - Prepare adsorbents from the WCGs recovered from biodiesel production step
    - Test the performance of the adsorbents for purifying the biodiesel.
  4. Characterization of the emission of polycyclic aromatic hydrocarbons (PAHs) from the oxidation and pyrolysis of carbon nanotubes (funded by *National Institute of Occupational Safety and Health*)
  5. Kinetic study on the acid esterification of waste cooking oil with high free fatty acid concentration for biodiesel production

#### Publications

- Kwan TA, **Tu Q**, Zimmerman J. Simultaneous extraction, fractionation, and enrichment of microalgal triacylglycerides by exploiting the tenability of neat supercritical carbon dioxide. *ACS Sustainable Chemistry & Engineering*, 4 (11), 6222-6230, **2016**.
- Tu Q**, Wang J, Lu M, Brougham A, Lu T. A solvent-free approach to extract the lipid fraction from sewer grease for biodiesel production. *Waste Management*, 54, 126-130, **2016**.
- Tu Q**, McDonnell, B. Monte Carlo analysis of life cycle energy consumption and greenhouse gas (GHG) emission for biodiesel production from trap grease. *Journal of Cleaner Production*, 112, 2674-2683, **2016**
- Tu Q**, Lu M, Yang YJ. Water consumption estimates of the biodiesel process in the US. *Clean Technologies and Environmental Policy*, 18(2), 507-516, **2016**
- Tu Q**, Lu M, Thiansathit W, Keener T. Review of water use and water savings in the algal biofuel process. *Water Environment Research*, 88 (1), 21-28, **2016**
- Tu Q**, Zhu C, McAvoy D. Converting campus waste into renewable energy: a case study for the University of Cincinnati. *Waste Management*, 39, 258-265, **2015**
- Chai M, **Tu Q**, Lu M, Yang YJ. Esterification pretreatment of free fatty acid in biodiesel production, from laboratory to industry. *Fuel Processing Technology*, 125, 106-113, **2014**.

#### Selected Scholarships & Awards

- The Jacqueline Shields Memorial Scholarship
- The John David Eye Scholarship
- 1<sup>st</sup> place winner of student poster contest at LCA XIV conference
- Best student paper of One Water Ohio WEA-AWWA 2014 conference
- The Richard C. Wigger Scholarship
- The Scarpino Award for Best Master of Science Thesis
- University of Cincinnati Graduate Student Governance Association (GSGA)’s Research Fellowship
- 2<sup>nd</sup> Place in 2011 Master Level Student Platform Paper Award -104<sup>th</sup> Air & Waste Management Association’s Annual Conference and Exhibition