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Decision Support Strategies for the Efficient Implementation of Circular Economy Principles in Process Systems

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Center for Process and Environmental Engineering

Date: Friday, December 20th, at 9:00am

Location: SEEC S228

Abstract:

The increasing concern on resources depletion is driving towards a more sustainable use of materials. Circular economy, and industrial symbiosis in the chemical sector, are focused on closing the loops of materials to reduce the problem of waste disposal and the consumption of fresh raw materials. However, some challenges arise from its implementation, being a critical one the transition from traditional product-based processes to their waste-to-resource counterparts. In this regard, systematic tools are required to identify which specific waste streams will offer better economic or environmental potential to be reused or recycled and the best way to convert a specific waste stream into added-value product(s).

This talk presents a multi-level framework for the implementation of waste-to-resource transformation processes to close material loops in process industries. First, based on an ontological framework for process classification, we develop a method to identify and assess potential waste-to-resource routes. Second, we build an optimization model for the synthesis of process networks taking into account the processes identified in the previous step. Finally, we synthesize the most promising processes and assess them using techno-economic and life cycle assessment. To illustrate the capabilities of the approach, we address a case study concerning the life cycle of plastics, with focus on chemical recycling emerging processes. Results at the different decision levels show that the proposed framework is an effective tool to assess on the implementation of circular economy on process systems by the identification of the most promising routes for material upcycling and the synthesis of transformation processes.

Bio:

Ana Somoza-Tornos is a PhD candidate at Technical University of Catalonia. She is member of the Center for Process and Environmental Engineering and collaborates with the Spanish Society of Industrial Chemistry and Chemical Engineering in their purpose to contribute to the expansion and progress of the Spanish chemical industry. She earned her BEng in Chemical Engineering in 2014 and her MSc in Chemical Process Engineering in 2016, both from Technical University of Catalonia.

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