JX received her BSc from the National University of Singapore and obtained her MSc in Chemical Engineering, *cum laude*, from Eindhoven University of Technology. After earning her PhD in Heterogenous Catalysis from Utrecht University in 2017, she conducted postdoctoral research at BasCat – UniCat BASF JointLab and University of Oslo before joining ENTEG in 2020.

JX's expertise is in catalysis engineering, with a focus on gas conversion and effluent gas management. These gases, which are often burned for energy or emitted as pollutants, represent an underuse resource. By developing more efficient catalytic processes, she aims to help drive the transition towards a circular carbon economy.

The research efforts of her team currently centres on two key directions, namely CO2/CO/H2 conversion to chemicals and fuels, e.g. sustainable aviation fuels, and effluent gas stream management from chemical recycling of plastics. Starting from thermodynamic considerations and reaction network analysis, her team builds on this foundation to design robust catalysts, apply reactor engineering strategies, and identify opportunities for process intensification.

Closing the Loop in Chemical Production: Catalytic Strategies for Effluent Gas Management

Effluent gas management is becoming increasingly important as chemical production transitions from linear to circular and closed-loop processes. Two complementary strategies are required: reducing the formation of undesired gases that are difficult to recycle, and developing catalytic processes to utilize such streams when they cannot be recycled.

The first part of this lecture focuses on the conversion of CO_2/CO/H_2 mixtures to fuels and chemicals via Fischer–Tropsch synthesis. This process integrates reverse water–gas shift (RWGS) with FTS, either directly in a single reactor or indirectly across multiple reactors with intermediate separations. In both cases, process intensification offers opportunities to improve efficiency.

The second part addresses the suppression of methane formation during the catalytic recycling of plastics. Hydrogenolysis and hydrocracking pathways are explored with the aim of steering selectivity toward more valuable hydrocarbons while minimizing methane formation.