

# Catalytic Upcycling of Plastic Waste into Single-Walled Carbon Nanotubes

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## ABSTRACT

Global plastic production now exceeds 400 million tons per year, with nearly 80 percent of discarded plastics ending up in landfills or leaking into the environment. Conventional recycling remains limited, highlighting the urgent need for catalytic strategies that recover carbon value from waste and transform it into useful materials. This challenge motivated my research into catalytic upcycling as a sustainable pathway for plastic waste valorization. I joined Prof. Kevin C.-W. Wu's lab at National Taiwan University because of its strong focus on nanoporous and mesoporous catalysts such as zeolites and metal organic frameworks, which provide ideal platforms for catalyst design and reaction control. My academic background in chemistry and materials science led me to view catalysis as a link between environmental responsibility and material innovation. My current research focuses on catalytic plastic upcycling to convert polymeric waste into high-value carbon nanomaterials such as single-walled carbon nanotubes. I am developing metal-based catalysts that guide the thermochemical conversion of plastic waste into carbon nanotubes. The research involves tuning catalyst composition and support structure to enhance carbon yield, nanotube structure, and selectivity. The goal of my research is to contribute to the circular carbon economy by designing efficient catalytic systems that enable the sustainable transformation of plastic waste into functional nanomaterials, giving it a renewed and meaningful purpose in modern material science.

## REFERENCES

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