

Depolymerization of Technical Grade Polyamide 66 and Polyurethane Materials via Hydrogenation

Viktoriiia Zubar
Catalysis Research Laboratory (CaRLa)

Abstract

Chemical recycling is a promising approach to save fossil feedstocks in the monomer synthesis and to reduce the amount of plastic waste. Hereby the hydrogenative depolymerization of polyamide 66 and polyurethane using a transition metal pincer complexes is presented.^[1]

The system features elevated temperatures and hydrogen pressures with THF or Toluene as solvent. Besides hydrogenation of amide functions in polyamide 66, the system is able to hydrogenate the typical linker units in polyurethanes as carbamate-, urea- or isocyanurate groups. A range of different postconsumer polyurethane materials were successfully depolymerized, including kitchen sponge, end-of-life upholstery foam, insulating foams and different packaging materials. Substantial amounts of products were achieved when even technical grade polymers were applied, allowing to recover the valuable amines (TDA, MDA) as well as the polyol components. The procedure can also be applied on a larger scale (10 g of polyurethane foam was successfully depolymerized applying only 0.02 mmol of Ru catalyst). Remarkably, turnover number in one batch close to 1000 is obtained for the hydrogenation of a soft foam like a household kitchen sponge.

References

- [1] Zhou, W.; Neumann, P.; Al Batal, M.; Rominger, F.; Hashmi, A. S. K.; Schaub, T., Depolymerization of Technical-Grade Polyamide 66 and Polyurethane Materials through Hydrogenation. *ChemSusChem* **2020**, DOI: 10.1002/cssc.202002465

Corresponding author:

Academic degree: Dr. rer. nat.
First name: Viktoriiia
Name: Zubar
Company: Catalysis Research Laboratory
Street: Im Neuenheimer Feld 584
ZIP code, City: 69120, Heidelberg
Email: viktoriiia.zubar@carla-hd.de
Phone: +4915773174188

Preference: Oral presentation Poster