

## Kerr-gated Raman investigations to understand LDPE decomposition by zeolites

This work uses an optical time gating technique to collect Raman spectra during the catalytic conversion of low-density polyethylene on different zeolites. The chemical recycling of “non-recyclable” plastics is an important step towards a circular carbon economy.

In applying Raman spectroscopy during plastic conversion, we can relate spectral changes with the catalytic activity, to understand further our separately collected catalytic testing data. Intermediate species have been identified, and primary decomposition is separated from secondary reactions taking place, for example to give aromatic side products. Studying such a system under real operando conditions up to 400°C in temperature is extremely challenging, but thanks to the Kerr-gated spectrometer, we can reject fluorescence that otherwise interferes with the Raman signals being collected.

The work highlights zeolite characteristics that are the most and least useful for the process of LDPE pyrolysis, for conversion back to pyrolysis oils for the synthesis of new virgin-grade plastic.

**Authors:** E. Campbell, S. Wallbridge, S. Dann, S. Kondrat, I. V. Sazanovich, P. Moreau, A. M. Beale

**Contact author:** E. Campbell  
([Campbelle3@cardiff.ac.uk](mailto:Campbelle3@cardiff.ac.uk))

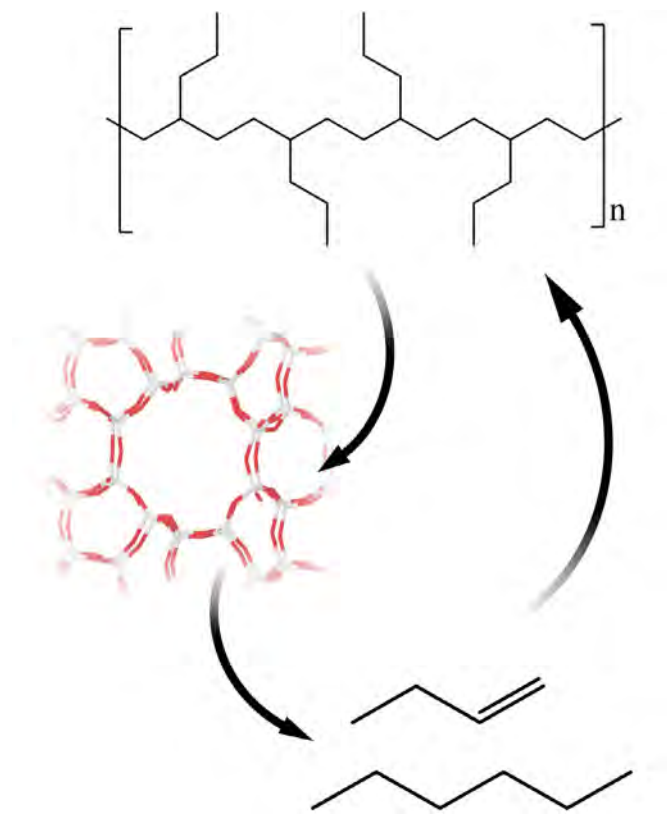


Figure 1: Figure of circularity of the process of chemically recycling LDPE with zeolite catalyst

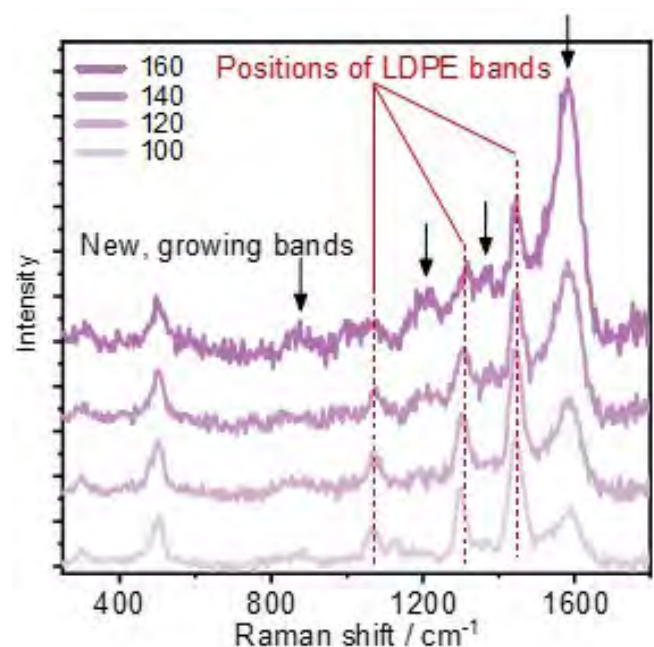


Figure 2: Raman spectra collected during the conversion of LDPE using H-Y as a catalyst