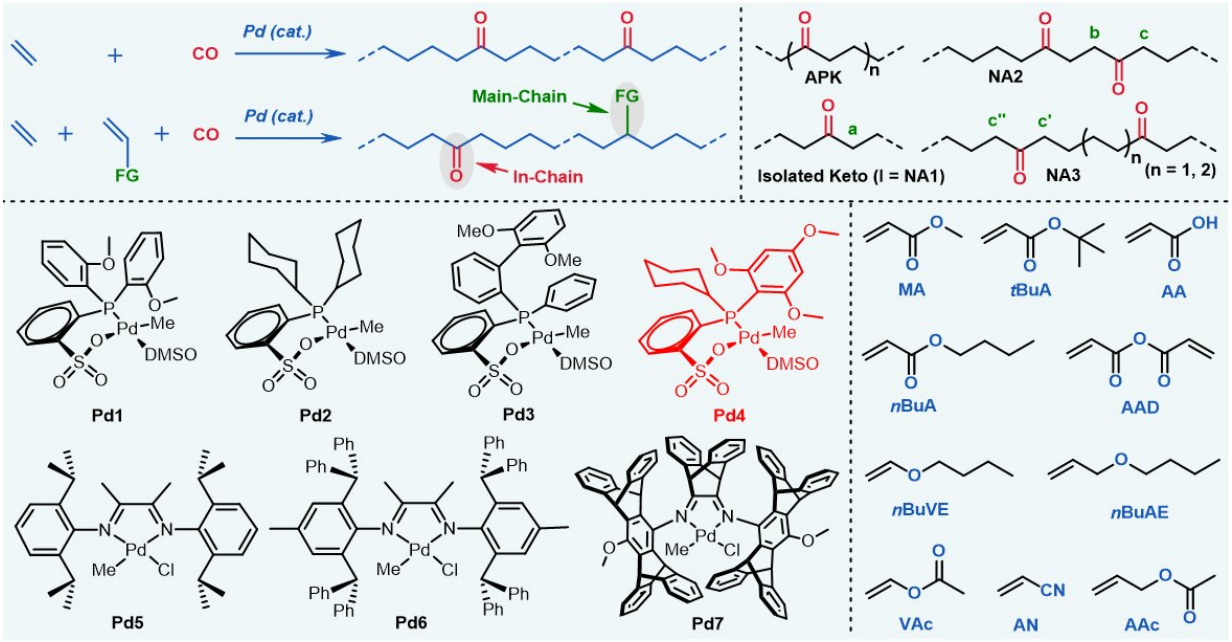
Degradable polyethylene plastics from the nonalternating terpolymerization of ethylene, CO, and polar monomers

June 5 2023



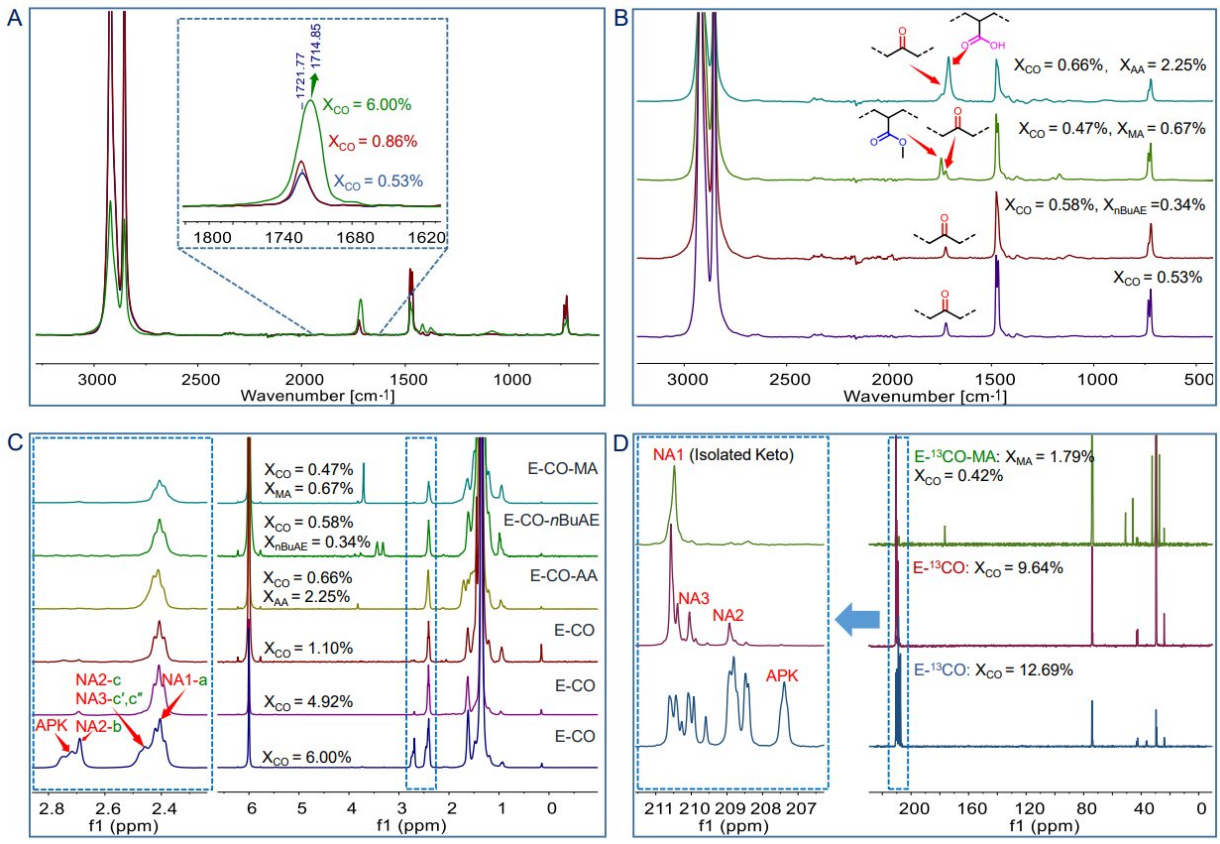
Copolymerization of E with CO and terpolymerization of E, CO, with polar monomer. Credit: Science China Press

In a study published in the journal *National Science Review* and led by Dr. Zhongbao Jian (State Key Laboratory of Polymer Physics and Chemistry, Changchun Institute of Applied Chemistry, CAS), E/CO/PM terpolymerizations were carried out with seven palladium catalysts,

which were strictly non-alternating (>99%) with Pd_4.

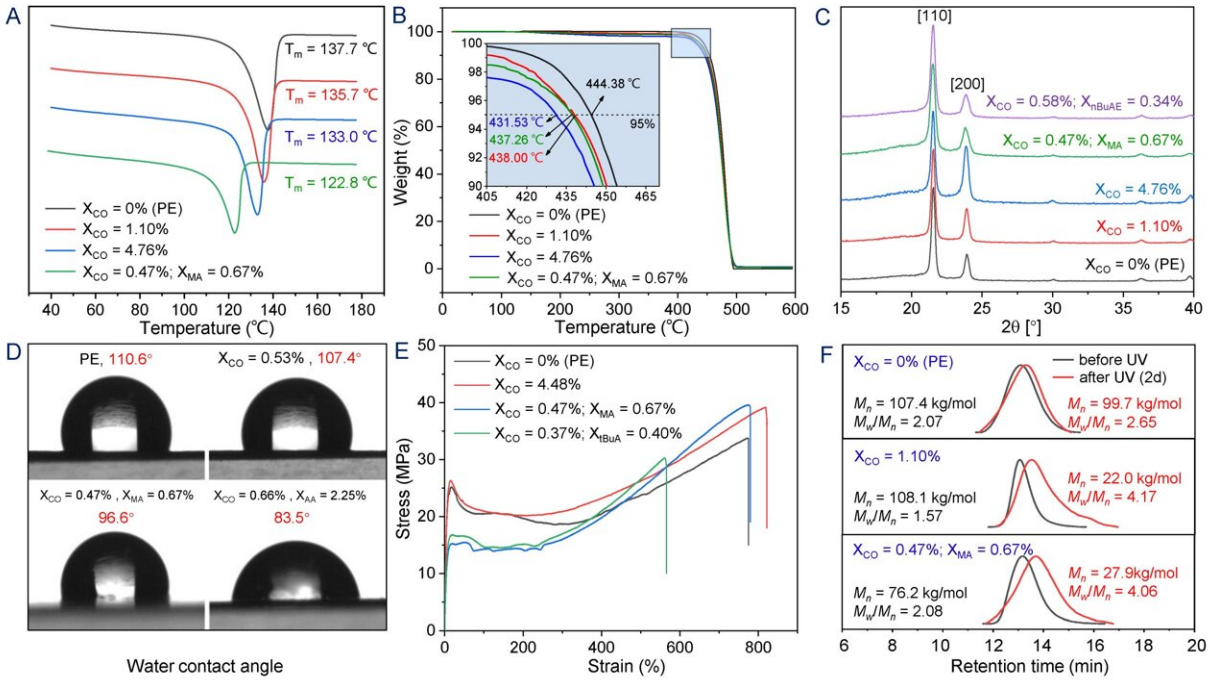
Polar monomers included acrylates, acrylic acid, vinyl ethers, vinyl acetate and acrylonitrile. High molecular weight linear polyethylene with the low content of isolated carbonyl group (selectivity > 99%) and polar functional group was developed.

The molecular structure of the resulting polymer was analyzed in detail, and the microstructure of the E/CO/PM copolymer was clearly characterized by IR, nuclear magnetic resonance spectroscopy ($^1H/^{13}C$/2-D NMR) and ^{13}CO labeling technology.



A: IR spectra of E/CO copolymers; B: IR spectra of E/CO/PM terpolymers; C: 1H NMR spectra of copolymers and terpolymers; D: 13C NMR spectra of 13CO-

labeled copolymers and terpolymers. Credit: Science China Press



A: DSC curves. B: TGA curves. C: WXRD analyses. D: Water contact angles. E: Tensile tests. F: Photodegradability of polymer. Credit: Science China Press

The properties of the resulting polymers were comprehensively tested by differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), wide-angle X-ray diffraction (WXRD), tensile testing, water contact angle (WCA) experiments, and photodegradation experimental techniques.

More information: Chaoqun Wang et al, Photodegradable Polar Functionalized Polyethylenes, *National Science Review* (2023). DOI: 10.1093/nsr/nwad039

Provided by Science China Press