

Detailed Information on Ethylene Polymers as revealed by ^1H and ^{13}C NMR.

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^{13}C NMR is extensively used for the characterization of homo- and copolymers of ethylene. It is used for the determination of the co-monomer composition, sequence distribution and short and/or long chain branching. Minor structural features or small amounts of additives present in polyethylene are often not accessible using ^{13}C NMR though. Because of the increased sensitivity of ^1H NMR and the resolution provided by the high field strengths of modern NMR spectrometers, we have used ^1H NMR for this purpose and proved it to be extremely powerful.

In this work we have looked at a variety of polyethylene samples, including low density polyethylene (LDPE), linear low density polyethylene (LLDPE) and metallocene-based ethylene polymers (m-PE). A number of industrially relevant problems have been addressed: type and amount of chain transfer agents (CTA), additives (primary and secondary antioxidants, acid scavengers, slipping agents etc.), unsaturations, co-monomer composition and distribution. Our study proves once again that ^1H and ^{13}C NMR are extremely valuable complementary techniques for the characterization of these types of polymers.