

Title (2)	:	Characteristics and Degradation of Carbon Low-Density Polyethylene (LDPE) Composites in the Environment
Journal	:	Char-based Composites: Production, Characterization, Limitations, and Emerging Applications
Document Type	:	Book chapter
Publisher	:	2024 Elsevier B.V.
UniKL Author	:	Robert Thomas Bachmann, Siew Kooi Ong
Link to Full Text	:	https://www.sciencedirect.com/science/article/abs/pii/B9780443154034000137?via%3Dihub
Link to UniKL IR	:	
Link to Scopus Preview	:	https://www.scopus.com/inward/record.uri?eid=2-s2.0-85209008883&doi=10.1016%2fB978-0-443-15403-4.00013-7&partnerID=40&md5=c38b0c79a342f35118b98a0a034f2c57
Abstract	:	Low-density polyethylene (LDPE) composites play an important role in many economies worldwide including agriculture. LDPE belongs to a group of saturated polyolefins that can be produced from both nonrenewable and renewable raw materials, and are claimed to be degradable. In the first part of this chapter, we summarize the components and physico-chemical properties of LDPE films used in degradation studies. In the second part, we discuss the effects of UV radiation, heat, and additives on the properties and degradability of LDPE films. In the last section, we then look at the evidence for the biotic degradation of LDPE films. We established that the main LDPE components used in agricultural LDPE films comprise of processing aids, antistatic agents, UV stabilizers, antioxidants, thermal pro-oxidants and various types of carbon fillers, which can often be linked to physico-chemical properties such as crystallinity, melting point, molecular weight, melt flow index (MFI), density, tensile strength, and elongation at break. Prolonged exposure of LDPE to UV-B radiation causes discoloration, embrittlement and loss of mechanical properties, while exposure to heat above 70°C may be required to shorten the lifespan of neat LDPE. Carbon fillers of any type and shape were reported to reduce the carbonyl index compared to neat LDPE or LDPE supplemented with antioxidant only. However, there is a lack of studies on the effect of biochar type and loading on the physico-chemical properties of LDPE-based agricultural films. From the few correctly executed biodegradation studies it was established that only a fraction of neat LDPE films degraded.