

Polyethylene degradation

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Polyethylene is widely used for many single use receptacles, packagings, fishing tools and agricultural films. However, due to recently increased environmental pressure, the eventual fate of plastics after use has become a more and more important matter of concern. It has been conceded that the molecular weight of polyethylene should be lower than 500; or it should at least be formulated with pro-oxidants and then oxidized to low molecular weight so as to promote biodegradability.

A microorganism capable of polyethylene degradation was isolated from the compost made from animal fodder, and was identified as *Chelatococcus* sp. E1 based on the results of the 16S rDNA analyses. It was active for the degradation of polyethylene whose molecular weight was as high as 23,700. The weight-average-molecular weight of the LMWPEs increased as a result of the biodegradation, due to the preferential assimilation of the low molecular weight fraction of polyethylene by the microorganism. The strain mineralized LMWPE-1H at a rate similar to that of LMWPE-1, in spite of the fact that LMWPE-1H was LMWPE-1 from which the extremely low molecular weight fraction had been removed. This result indicates that the isolated strain assimilated not only the extremely low molecular weight PE fraction but also the PE molecules with molecular weight high enough to be insoluble in the cold toluene solution. The FTIR spectra of the LMWPEs revealed that the C-O stretching peaks and those corresponding to alkenes became more intense, as a result of the biodegradation; revealing that dehydrogenation took place concomitantly with microbial oxidation.

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