

Prediction of Biodegradation of Polymeric Materials in Soil

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The studies on biodegradable plastics with respect to biodegradation behavior are important for their application in environment. We have biodegradation data of typical polymeric materials in soil which were obtained from a joint research with local governmental research institutes in Japan. The data covered with all Japanese area. However, the tested places have much variation, that is, kind of soil, location, climate, composition of soil, distribution of microorganism, etc. We have been studying factors affecting biodegradation of polyesters in soil.

Microorganisms in soil were studied from the viewpoint of influence on biodegradation of the polymers in the natural environment. More than 90% of microorganisms in soil were bacteria and actinomycete. The amounts of them and the biodegradation of polyesters are deeply related. Microorganisms degrading poly(butylene adipate / succinate), poly(ϵ -caprolactone), poly(3-hydroxy butyrate), poly(3-hydroxybutyrate/3-hydroxyvalyrate) and poly(L-lactic acid) were counted as clear zones on agar plates of the polymer emulsion. In the case of synthetic polymers, the numbers of the biodegrading microorganism did not show a good agreement with the results of the biodegradation in soil. It means that degradation in soil would be greatly effected by environmental factors. On the contrary, the degradation activity of the soil extract solution for synthetic polymers has a relationship between the environmental degradation results of those. In order to predict environmental degradation of polyesters in soil, various factors such as comprehensive analysis of resin, climate, location, soil and microorganism parameters were expressed numerically and functionally.

These results found to be applied to degradation prediction in water environment, e.g. sea, river, and lake. Microorganisms in water and polymer-degraders analyses were carried out and the relationships between the results and degradation showed similar tendency to those of soil degradation.

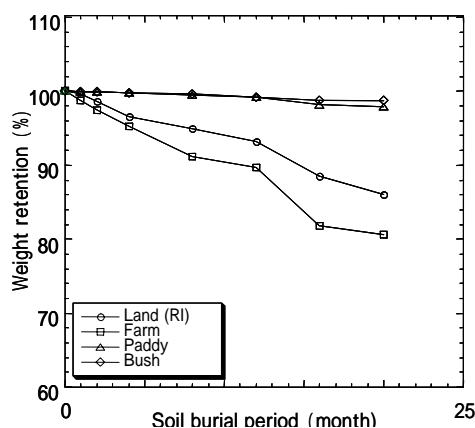


Fig. Soil burial biodegradation curves of poly(buthylene succusinate/adipate) as a average of weight retention during 20 months