

Comparative Life Cycle Assessment of High Barrier Polymer Packaging for Selecting Resource Efficient and Environmentally Low-Impact Materials

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Abstract : In this study three types of multilayer gas barrier plastic packaging films were compared using life cycle assessment as a tool for resource efficient and environmentally low-impact materials selection. The first type of multilayer packaging film (PET-AlOx/LDPE) consists of polyethylene terephthalate with barrier layer AlOx (PET-AlOx) and low density polyethylene (LDPE). The second type of polymer film (PET/PE-EVOH-PE) is made of polyethylene terephthalate (PET) and co-extrusion film PE-EVOH-PE as barrier layer. And the third one type of multilayer packaging film (PET-PVOH/LDPE) is formed from polyethylene terephthalate with barrier layer PVOH (PET-PVOH) and low density polyethylene (LDPE). All of analyzed packaging has significant impact to resource depletion, because of raw materials extraction and energy use and production of different kind of plastics. Nevertheless the impact generated during life cycle of functional unit of II type of packaging (PET/PE-EVOH-PE) was about 25% lower than impact generated by I type (PET-AlOx/LDPE) and III type (PET-PVOH/LDPE) of packaging. Result revealed that the contribution of different gas barrier type to the overall environmental problem of packaging is not significant. The impact are mostly generated by using energy and materials during raw material extraction and production of different plastic materials as plastic polymers material as PE, LDPE and PET, but not gas barrier materials as AlOx, PVOH and EVOH. The LCA results could be useful in different decision-making processes, for selecting resource efficient and environmentally low-impact materials.

Keywords : life cycle assessment, polymer packaging, resource efficiency, materials extraction, polyethylene terephthalate

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