

Overview

An experiment was conducted in order to determine if injection stretch blow molded (ISBM) bottles made out of Ingeo biopolymer would be resistant to jojoba oil versus polyethylene (PE) and polyethylene terephthalate (PET) polymers.

Experimental

Two bottles each made out of Ingeo biopolymer, PET, and PE (for a total of six specimens) were filled with jojoba oil, weighed, capped, and then placed into an oven set at 47°C (117°F). The bottles were inspected over time to look for signs of oil migration or changes in appearance and feel. The samples were also weighed over time to determine any loss of oil through the bottles.

After approximately 14 days, the two PE bottle specimens started to show signs of deformation along the sidewall panel. The Ingeo bottles and the PET bottles showed no signs of oil migration or loss of package integrity. Only the PE bottles were observed to be affected by the oil at this storage temperature.

In total, the bottles were left in the oven for approximately eight weeks. After eight weeks, the bottles were inspected and the PE bottles showed a significant lack of sidewall panel integrity with high deformation. No deformation of the Ingeo bottles or PET bottles was observed. Also, no oil was noticed on the outside portions of any of the bottles that were in the oven – this observation also included the PE bottles.

Throughout the test, the bottles were weighed to look for signs of oil loss. The beginning and ending bottle weights are as follows:

Sample	Weight – Start of Test (g)	Weight – End of Test (g)	% Weight Loss
Ingeo bottle “A sample”	311	310.83	0.05
Ingeo bottle “B sample”	319.5	319.34	0.05
PE bottle “A sample”	278.97	278.82	0.05
PE bottle “B sample”	274.42	274.33	0.04
PET bottle “A sample”	467.24	466.77	0.10
PET bottle “B sample”	461.4	460.98	0.09

From the recorded data above, the PET bottles showed a slightly higher percent weight loss over the eight weeks they were in the oven. The Ingeo bottles and PE bottles lost about the same amount of oil over this same time frame and storage condition.

Conclusion

Ingeo bottles can be adequate containers for jojoba oil at these conditions. The Ingeo bottles were better than the PE bottles in that no deformation took place. Based upon the percent weight loss results, the Ingeo bottles exhibited equal or slightly better oil resistance than both PET and PE bottles.

Safety and Handling Considerations

Material Safety Data (MSD) sheets for Ingeo biopolymers are available from NatureWorks LLC. MSD sheets are provided to help customers satisfy their own handling, safety, and disposal needs, and those that may be required by locally applicable health and safety regulations, such as OSHA (U.S.A.), MAK (Germany), or WHMIS (Canada). MSD sheets are updated regularly; therefore, please request and review the most current MSD sheets before handling or using any product.

The following comments apply only to Ingeo biopolymers; additives and processing aids used in fabrication and other materials used in finishing steps have their own safe-use profile and must be investigated separately.

Hazards and Handling Precautions

Ingeo biopolymers have a very low degree of toxicity and, under normal conditions of use, should pose no unusual problems from incidental ingestion, or eye and skin contact. However, caution is advised when handling, storing, using, or disposing of these resins, and good housekeeping and controlling of dusts are necessary for safe handling of product. Workers should be protected from the possibility of contact with molten resin during fabrication. Handling and fabrication of resins can result in the generation of vapors and dusts that may cause irritation to eyes and the upper respiratory tract. In dusty atmospheres, use an approved dust respirator. Pellets or beads may present a slipping hazard. Good general ventilation of the polymer processing area is recommended. At temperatures exceeding the polymer melt temperature (typically 170°C), polymer can release fumes, which may contain fragments of the polymer, creating a potential to irritate eyes and mucous membranes. Good general ventilation should be sufficient for most conditions.

Local exhaust ventilation is recommended for melt operations. Use safety glasses if there is a potential for exposure to particles which could cause mechanical injury to the eye. If vapor exposure causes eye discomfort, use a full-face respirator. No other precautions other than clean, body-covering clothing should be needed for handling Ingeo biopolymers. Use gloves with insulation for thermal protection when exposure to the melt is localized.

Combustibility

Ingeo biopolymers will burn. Clear to white smoke is produced when product burns. Toxic fumes are released under conditions of incomplete combustion. Do not permit dust to accumulate. Dust layers can be ignited by spontaneous combustion or other ignition sources. When suspended in air, dust can pose an explosion hazard. Firefighters should wear positive-pressure, self-contained breathing apparatuses and full protective equipment. Water or water fog is the preferred extinguishing medium. Foam, alcohol-resistant foam, carbon dioxide or dry chemicals may also be used. Soak thoroughly with water to cool and prevent re-ignition.

Disposal

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. For unused or uncontaminated material, the preferred options include recycling into the process or sending to an industrial composting facility, if available; otherwise, send to an incinerator or other thermal destruction device. For used or contaminated material, the disposal options remain the same, although additional evaluation is required. (For example, in the U.S.A., see 40 CFR, Part 261, "Identification and Listing of Hazardous Waste.") All disposal methods must be in compliance with Federal, State/Provincial, and local laws and regulations.

Environmental Concerns

Generally speaking, lost pellets are not a problem in the environment except under unusual circumstances when they enter the marine environment. They are benign in terms of their physical environmental impact, but if ingested by waterfowl or aquatic life, they may mechanically cause adverse effects. Spills should be minimized, and they should be cleaned up when they happen. Plastics should not be discarded into the ocean or any other body of water.

Product Stewardship

NatureWorks LLC has a fundamental duty to all those that make and use our products, and for the environment in which we live. This duty is the basis for our Product Stewardship philosophy, by which we assess the health and environmental information on our products and their intended use, then take appropriate steps to protect the environment and the health of our employees and the public.

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