Migration of Biobased Plastic from Biodegradable Polyester and Thermoplastic Starch

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Abstract

Biobased plastic (BP) was reputed to the environmentally friendly properties. Many researches have focus on improving the physical and mechanical properties. However, as food contact materials and food packages, the migration test of BP should be conducted to ensure the safety of consumers. In this research, overall migration of 4 formulas of BP has been tested. Biodegradable polyester (polylactic acid: PLA) was formulated with thermoplastic starch (TPS) to form BP sheet samples. They were formulated at the ratio of PLA:TPS as 60:40 and 80:20 with additional of zeolite at 1% as a compatibilizer. The overall migration tests were conducted follow the Regulation EU 10/2011 on plastic materials and articles intended to come into contact with food. The chemical migrants from BP samples were extracted in food simulants. Four food simulants which were represented each kind of foods were 10% ethanol (Simulant A) for aqueous foods, 3% acetic acid (Simulant B) for acidic foods, 20% ethanol (Simulant C) for alcoholic foods, 50% ethanol (Simulant D) for dairy fatty foods. The extractions were conducted at the specific conditions, range from 2 h to 10 days at 10 to 70 °C which resemble to the intended usage condition. After the extraction, the BP samples were tested for the mechanical properties compared with the samples before the extraction. The simulants were proceeded to determine the amount of migrants then compare with the overall migration limit (10 mg/dm^2). The overall migration results showed that the BP samples still have some limitations in application under severe condition of overall migration testing. The mechanical test show significantly reduction of properties after contact with food simulants. Further investigations are needed to clarify the proper condition for commercial usage such as the sensory evaluation to clarify the consumer acceptability level of the reduce mechanical properties.

Image

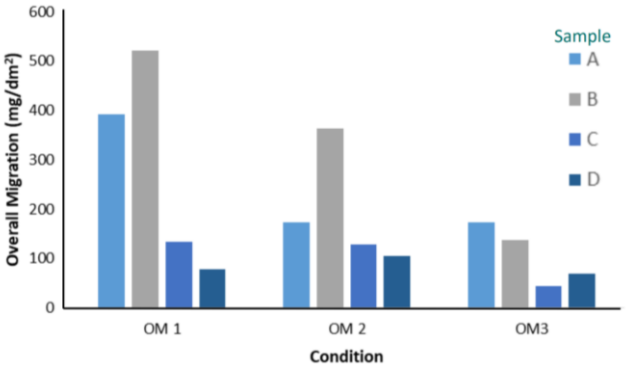


Figure 1: Overall migration of bio-plastic in simulant C

Recent Publications

1. Bradley EL (2010) Biobased materials used in food contact applications: an assessment of the migration potential. The Food and Environment Research Agency.
2. EU Regulation (EC) No 10/2011 of 14 January 2011 on plastic materials and articles intended to come into contact with food. Available online: https://eur-lex.europa.eu/legal-content/eN/ALL/?uri=CELEX%3A32011R0010
3. Muller J, González- Martínez C and Chiralt A (2017) Combination of Poly(lactic) Acid and Starch for Biodegradable Food Packaging. Materials 10: 952.
4. Thipmanee R and Sane A (2012) Effect of zeolite ZSM-5 incorporation sequence on compatibility of polyethylene/thermoplastic starch blend. J. Appl. Polym. Sci. 126: E251–E261.
5. Jang WY, Shin BY, Lee TJ and Narayan R (2007) Thermal Properties and Morphology of Biodegradable PLA/Starch Compatibilized Blends. J. Ind. Eng. Chem. 13(3): 457-464.



Biography

Dr Busarin Chongcharoenyanon has background on food science and technology. She interested in food safety especially in microbiological and chemical aspect. The safety of food contact materials and food packaging is her main research of interest. She believes that, in order to improve the safety of the consumer, we can not only focus on the food quality but also the food packaging and the related materials.

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Notes/Comments: