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Xu LI
Institute of Materials Research and Engineering, Singapore

Hybrid polymer materials for oxygen barrier and scavenging food packaging

The main purpose of packaging is to protect the packed products from the contamination, maintain the high quality level of the products over sufficient period during the distribution, storage, sale, and use. Products especially perishable foods are highly sensitive to oxygen. However, conventional transparent plastic films have poor oxygen barrier property and the technologies in the market to improve packaging's oxygen barrier usually lead to high equipment investment, high energy consumption, and low transparency. To overcome this issue, two technologies have been developed by our group. For the first transparent oxygen-barrier packaging technology, natural source silicates have been successfully introduced into polymer layer to create torturous path of oxygen molecules to enhance its barrier against oxygen. The key technology here is to align all the plate-like silicate filler in one orientation. As shown in the cross-section view of the oxygen-barrier coating on polyethylene terephthalate (PET) film through scanning electron microscope (SEM) and transmission electron microscopy (TEM), the plate-like silicate filler form a compact layer with high orientation on the PET film, which is simply implemented via standard doctor-blade coating process (Figure 1). With this technology, transparent polymer films with oxygen transmission rate less than 0.5 cc/m2.day have been achieved. With the second technology, iron-based nanomaterials with high oxygen scavenging property have been developed and integrated into coating suspension to form transparent coating on plastic film. Such transparent coated films can achieve oxygen scavenging capacity about 8.8 cc/100 cm2 and the transparency is not compromised much.

Biography

Xu LI is a Senior Scientist at Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology and Research (A*STAR), Singapore. He finished his PhD study in polymer chemistry in the Department of Chemistry, National University of Singapore in 2001. He is an adjunct Associate Professor of the Department of Chemistry, National University of Singapore from 2012. He has published more than 100 research papers and filed 15 international patents. Some of those patented technologies were successfully adopted by industry companies. As a principle investigator, he is now leading a research team on polymeric materials development for various applications, including controlled release, bio imaging, energy storage and food packaging.

x-li@imre.a-star.edu.sg