

## Avantium produces first plant-based pouches of BOPEF film

Resulting from an application demonstration project with various collaboration partners, Avantium's business unit Synvina has produced the first plant-based pouches using its biaxially oriented polyethylene furanoate (BOPEF) film. Avantium has jointly developed BOPEF film together with Toyobo. The pouches consist of a two-layer laminate of BOPEF and a plant-based polyethylene (PE) sealing layer.

The BOPEF-pouches differentiate from many other plant-based pouches by their exceptional fit with the current practice for BOPET printing and pouch conversion, while offering over 10x higher O<sub>2</sub> barrier. BOPEF/PE's inherent oxygen permeability of about 10 cc/m<sup>2</sup>.day.atm fits well with oxygen-sensitive products such as cheese & dairy, dry snacks, sauces and cosmetics, which today employ more complex multilayer structures like PVDC-coated BOPET or EVOH-containing sealant film. Besides the added simplicity, BOPEF/PE pouches offer excellent toughness and clarity, and are suitable for dry and liquid products.

Over 50 billion stand-up pouches are sold every year, with an expected CAGR of 5.6%. Circular economy remains an important goal of the packaging industry, although in comparison to rigid packaging an effective post-consumer economy for flexible packaging is still in an early stage. Multilayer structures required for highly sensitive products are particularly challenging to recycle. End-of-life solutions for the mid-barrier BOPET/PE segment are under development, and based on the similar chemical similarity between PEF and PET such solutions may well be applied to high-barrier BOPEF/PE. Therefore, BOPEF/PE pouches are coming at the right time.



Avantium produces FDCA and PEF based on the proprietary YXY technology in its pilot plant in Geleen (NL) since 2011, which after its expansion in 2016 is operated by its business unit Synvina. Avantium

furthermore pilots technologies for plant-based ethylene glycol and 2G industrial sugars, which can also be used for PEF in addition to wider market uses. The pouches are an example of the versatility of PEF for additional applications to bottles, including higher-value applications. In the process of demonstrating its YXY technology for a first commercial plant, Avantium and Synvina are increasing its efforts in finding additional customers and partners.

The pouches in this work were made using BOPEF jointly developed with Toyobo and a commercial 55% plant-based PE sealant film formulation, though higher plant-based contents are feasible based on commercial plant-based -PE availability. Ongoing development focuses on broader applicability of BOPEF as well as metallization and transparent (AlOx/SiOx) vapor coating to obtain higher barriers than incumbent vapor coated films. As such, BOPEF could enter into many more flexible film segments and expand the market with simplified structures.

**Table – Typical properties of BOPET and BOPEF film**

| <b>Biaxially Oriented film</b>                   | <b>BOPET</b> |    | <b>BOPEF</b> |    |
|--|--------------|----|--------------|----|
| Gauge (µm)                                       | 12           | 16 | 12           | 16 |
| Strength (MPa)                                   | 230          |    | 260          |    |
| Break elongation (%)                             | 100          |    | 47           |    |
| Oxygen transmission (cc/m <sup>2</sup> .day.atm) | 120          | 90 | 11           | 9  |
| Moisture transmission (g/m <sup>2</sup> .day)    | 50           | 38 | 15           | 11 |