

Polymer hybrid thin-film composites for food packaging and membrane filters

October 23 2014

Juha Nikkola M.Sc.(Tech.), Senior Scientist at VTT Technical Research Centre of Finland, developed new hybrid materials in his doctoral research project for use in the manufacture and modification of thin-film composites. The project resulted in new materials suitable for instance for food packaging with enhanced diffusion barrier and for membrane filters with improved anti-fouling properties used in water purification. In the future, similar materials may find use in flexible OLED displays and in wall and ceiling panels.

The doctoral research project involved developing surface materials that decrease bacterial adhesion to the surface. Improved surface materials can help keep membrane filters or wall surfaces clean or improve the preservation of food.

Food spoilage can be delayed with a new type of cardboard package coated with a plastic incorporating the thin-film composite structure developed in the present project. Such [diffusion barrier](#) materials may also find use in flexible OLED displays in the electronics industry or in replacing thickly layered paint on wall and ceiling panels.

The doctoral research project involved studying and developing flexible thin-film composites using various coating techniques and studying the impact of the surface layer on the permeability and anti-fouling properties of the thin-film composite. The hybrid materials developed can be produced in roll-to-roll processing. The research focused on atmospheric plasma deposition, [atomic layer deposition](#) (ALD) and sol-

gel deposition techniques.

What are hybrid materials?

A hybrid material is simply a combination of two [materials](#) at the macro, micro or nano level. Hybrid material is typically a blend, multilayer or nanostructured material. For instance, multilayer structures manufactured using thin-film deposition techniques can be named as [hybrid materials](#).

Thin-film composites usually consist of three layers with different functions. The support and core layers provide the mechanical properties such as strength and flexibility. The core layer may also have properties affecting the chemical durability, permeability or composition of the composite. The properties required of the skin layer may have to do with separation efficiency, diffusion barrier performance, roughness, surface energy or liquid or gas permeability.

More information: The thesis is available online at Polymer hybrid thin-film composites with tailored permeability and anti-fouling performance: www.vtt.fi/inf/pdf/science/2014/S66.pdf

Provided by VTT Technical Research Centre of Finland

Citation: Polymer hybrid thin-film composites for food packaging and membrane filters (2014, October 23) retrieved 7 August 2024 from <https://phys.org/news/2014-10-polymer-hybrid-thin-film-composites-food.html>

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