

Plastics Engineering



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Plastics in Automotive: Lightweighting with Composites

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A close-up, high-angle photograph of a car's wheel hub and brake assembly. The image is dominated by metallic surfaces, showing the intricate details of the brake caliper and the hub. The lighting is dramatic, with strong highlights and deep shadows, emphasizing the textures and curves of the components. The overall color palette is a mix of dark blues, greys, and metallic tones.

WILEY

By Roger Corneliussen

Cheaper Carbon Fiber Composites

U.S. Patent 9,365,685 (June 14, 2016), "Method of Improving Adhesion of Carbon Fibers with a Polymeric Matrix," Frederic Vautard, Soydan Ozcan and Felix Leonard Paulauskas (UT-Battelle LLC, Oak Ridge, Tenn., USA).

Epoxy carbon-fiber-reinforced composites are known for their outstanding mechanical properties and low density. However, they are expensive and difficult to process, making broader application to consumer markets too expensive. Furthermore, the mechanical properties of cheaper resins do not match that of high-performance epoxy resins. Vautard, Ozcan and Paulauskas functionalized carbon fibers with partially cured epoxy or amine-sizing agents. Epoxy-reactive groups include hydroxyl (OH), carboxyl (COOH) and amino (NH₂) groups. These fibers can be used in vinyl polymers as well as condensation polymers with good results. Amine groups can covalently bond with a variety of polymers, including polycarbonates, polyesters, acrylics, nylons, polyether ether ketones, polysulfones, polyvinylalcohol and polyimides.

Breathable Film for Cheese Packaging

U.S. Patent 9,365,687 (June 14, 2016), "PVDC Formulation and Heat-Shrinkable Film," Dimitris Gkinosatis (Flexopack S.A. Plastics Industry, Koropi, Greece).

Special foods such as gassing cheese products require special packaging that release carbon dioxide gas that causes package ballooning. At the same time, oxygen permeability must be low enough to prevent oxidation. The majority of heat-shrinkable film uses polyvinylidene chloride (PVDC) resins to stop oxygen diffusion, which also prevents carbon dioxide diffusion. Gkinosatis developed a special polymer blend consisting of a PVDC copolymer, ethylene vinyl acetate copolymer, polyvinyl chloride (PVC), epoxidized oil and other additives. Their material contains less than 2 wt% ethylene vinyl acetate copolymer with 40 to 50 wt% vinyl acetate per weight of PVC content, 0 to 2 wt% silica, talc and other materials such as silicones, high-density polyethylene or tetrasodium pyrophosphate. In addition, multilayer film is developed with a PVDC layer. The other layers may contain

ethylene alpha olefin copolymers, propylene alpha olefin copolymers, propylene ethylene copolymers, styrene polymers or ionomers. These materials do prevent long-term ballooning for packaged gassing cheeses while preventing oxygen diffusion.

Portable Pyrolysis

U.S. Patent 9,365,775 (June 14, 2016), "Waste Recycling System," Gaylen La Crosse, Jeremy La Crosse and Michael Galich (YAGS LLC, Evanston, Ill., USA).

These days, the volume of plastics discarded by consumers is enormous, leading to ever-growing landfills. Recycling is becoming more popular but separation, selection and transportation continues to be a challenge. Pyrolysis is promising but catalysts are expensive and transportation is, still, a problem. La Crosse, La Crosse and Galich developed a portable reactor system for pyrolysis that can easily be scaled up or down and is operated without a catalyst. This system consists of two reactor sections connected to a condenser. The waste is heated at pressures less than atmospheric pressure to 500 to 800 ° C to convert the waste hydrocarbons to gaseous hydrocarbons. The product is transferred to condensers forming liquids. Char is removed in the second reactor. Candidate industries include paper mills, waste rubber tires, and animal and agricultural wastes.

Rotomolding Large Structures

U.S. Patent 9,370,882 (June 21, 2016), "Cost-Effective and Efficient Air Circulation System for a Vehicle having Rotomolded Body Assembly," Nigel Giddons and John William Taylor (Tata Technologies Pte. Ltd., Singapore).

Effective vehicle air circulation and ventilation systems require custom-fabricated duct work. This means increased manufacturing costs for tooling and installation as well as maintenance. A low-cost molding system that does not require elaborate assembly is needed. Giddons and Taylor developed a cost-effective and efficient air circulation system for vehicles formed by rotational molding. The rotational molding can be multilayered and includes foam layers for