Filter media

Advancements in the production of meltblown fibres

Meltblowing is an essential process in the production of filtration media, consisting of single- and sub-micron diameter fibres. At times, these fibres can be exposed to chemicals and environments that degrade the fibres and adversely affect product performance. This article explores the use of a more suitable "chemically resistant" fibre media in the process.

In this article the authors present advancements in the development of a novel polyvinylidene fluoride (PVDF) fluoropolymer resin suitable for producing fibers using conventional meltblown fibre spinning equipment. The new fluoropolymer resin has processing characteristics similar to polypropylene meltblown fibre spinning grades. Fibres produced from the new fluoropolymer resin offers significant improvements in chemical and oxidative resistance compared to non-fluoropolymer fibres.

Meltblowing is a ubiquitous commercial process for the production of filtration media. Thermoplastic polymers such as polypropylene (PP) or poly(butylene terephthalate) or poly(ethylene terephthalate) polyesters having extremely high melt flow rates account for over 99% of all meltblown materials produced.[1]

Depending on the intended application, fibres can be exposed to aggressive chemicals and oxidative environments that degrade the fibres and adversely affect product performance and use life.

In this example, the application would benefit by having a more suitable "chemically resistant" fibre media assuming it could be produced economically. The industry would often consider fluoropolymer resins, but unfortunately, in this case, this option is limited in part due to the inability to produce fluoropolymer fibres using conventional melt processing equipment.

In order to expand the availability of fluoropolymer fibres, a new "melt processable" fluoropolymer was needed that could be

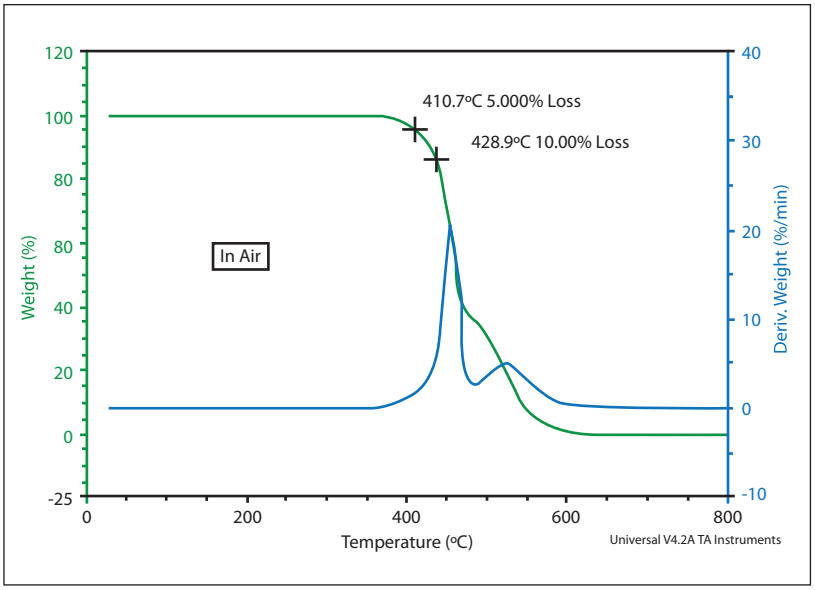

Figure 1. TGA in air for natural PVDF homopolymer.

processed on conventional meltblown equipment. The new PVDF fluoropolymer provides processing characteristics similar to polypropylene while providing performance attributes inherent of fluoropolymers.

An introduction to PVDF resins

Poly (vinylidene fluoride) (PVDF) homopolymer and copolymer resins are used in a wide variety of industrial applications due to their desirable and wide-ranging performance characteristics. PVDF resins are chemically resistant to a broad range of chemicals and are acceptable for continuous use with most acids, weak bases, halogens, halogenated solvents, hydrocarbons, alcohols, salts and oxidants, however are not used with strong bases (pH>12), ketones, primary amines, esters or fuming acids.[2] Other important attributes of PVDF resins include excellent UV, oxidation, ozone, and abrasion resistance, low flame spread and smoke generation, high purity, and hydrophobicity.

PVDF homopolymers are highly crystalline fluoropolymer resins often specified in applications requiring rigidity, resistant to creep, chemical resistance and good barrier properties. The most common items produced with PVDF homopolymers include solid piping, flexible tubing, linings for metal pipe and vessels, braided hose, fittings, valves, pump housings, filtration components (membranes, molded filter housings and porous products), tower packing, injection nozzles, mixers, stock shapes, lined tanks, monofilament, multifilament, and powder coatings.

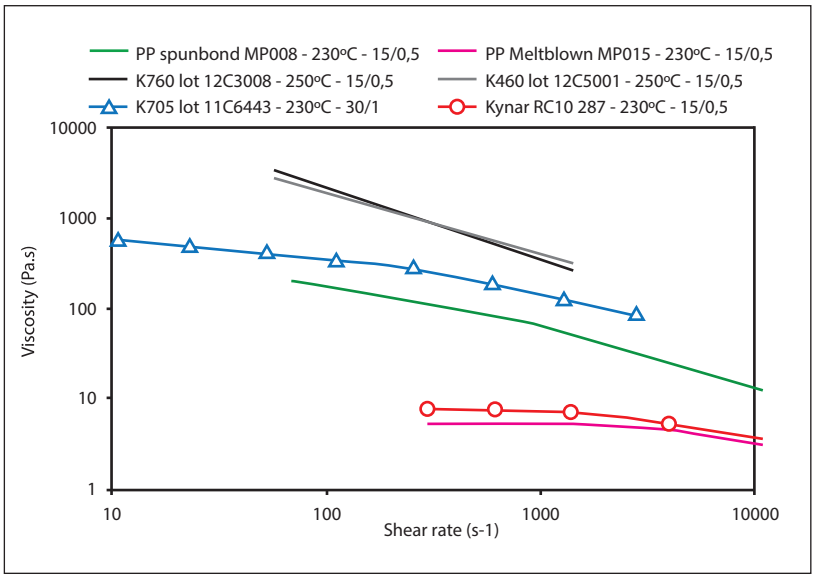

Figure 2. Rheology comparison of polypropylene (PP) and PVDF grades.

PVDF homopolymers exhibit high heat deflection temperatures, are rated for continuous use up to 150°C, and are often used to replace stainless steel in