Fluoropolymer-Based Adhesive Grades for Vehicle Fuel Systems and Components

Produce parts and components that can handle harsh fuel mixes and aggressive chemicals

Fluon ADHESIVE

Biofuels and gasolines that contain additives, alcohol and flex fuels like E15 and E85 put new demands on vehicle fuel systems and components that are made from standard compounds. They dry out fuel hoses, causing them to crack, stretch and soften. They can also damage fuel system components, block fuel injectors and cause harmful emissions. Manufacturing can avoid these issues by using new adhesive fluoropolymer grades for chemical-resistant hose components.

For over a decade, U.S. policymakers have encouraged the use of ethanol and other biofuels as additives in internal combustion engines to meet a range of objectives relating to the environment, the economy and energy security. Perhaps most significant, in 2005 Congress created the renewable fuel standard (RFS) program to reduce greenhouse gas emissions, expand the nation's renewable fuels sector and decrease reliance on imported oil. The RFS requires renewable additives to be blended into transportation fuel in increasing amounts each year, escalating to 36 billion gallons by 2022.

According to the Department of Energy, use of fuel ethanol and bio-diesel in the U.S. transportation sector has grown each year since 2000. Vehicles in use now consume roughly ten times the volume of biofuels that they did 15 years ago. Blending mandates elsewhere—in the EU, Brazil and China—similarly have driven biofuel growth in the transportation sector and are expected to continue to do so through the early part of the next decade.

The changing composition of the fuel mix—most gasoline sold in the U.S. contains up to 10 percent alcohol (E10), with E15 and E85 ("flex fuel") blends now widely available—has put new demands on vehicles' fuel system components. Aggressive biofuel blends have chemical compositions that can damage the compounds used in standard fuel hoses—leading to drying out, stretching, softening or cracking of these materials.

Oligomers or extractables from the hose can defile or block fuel injectors, negatively impacting fuel system monitoring sensors and reducing engine efficiency. Moreover, ethanol and other biofuels can greatly increase the permeation of harmful evaporative emissions, such as volatile organic compounds, through fuel hoses.





MELT PROCESSABLE ADHESIVE-GRADE RESINS THAT CHEMICALLY ADHERE TO DISSIMILAR MATERIALS

As environmental and weight-saving regulations have become more stringent in the U.S. and around the world, Fluon™ AH-ETFE resins provide an engineered solution to OEMs' automotive component construction challenges. These resins, which chemically adhere to dissimilar materials, reduce weight and eliminate tie layers in multilayer hose constructions.

Fluon AH-ETFE compounds also enable hose line constructions to meet more strict emission standards because they have low fuel permeation rates. In fact, fuel permeation associated with these adhesive ETFE compounds decreases as the percentage of alcohol in the fuel mix rises—with rates as low as 0.40 g mm^2/m^2 day for alcohol fuel content up to 100 percent ethanol.

Fluon AH-ETFE resins are ideal for constructions that require high conductivity levels, chemical and permeation resistance, protection against static buildup and aggressive bonding to polyamide materials. When manufactured with Fluon AH-ETFE, automotive components such as liquid and vapor fuel lines, compressor hoses, fuel tanks and filler necks exhibit superior performance in any construction.

Fluon ETFE is a melt-processable copolymer of tetrafluoroethylene and ethylene. AH-600 series products produce a low-melting compound that offers manufacturers a wide process window and strong compatibility with polyamide nylons for co-extrusion. AH-700 series products balance performance and economics. The AH-800 series has a higher upper-end temperature rating (approaching 200 degrees Celsius) and improved resistance to stress cracks at elevated temperatures.

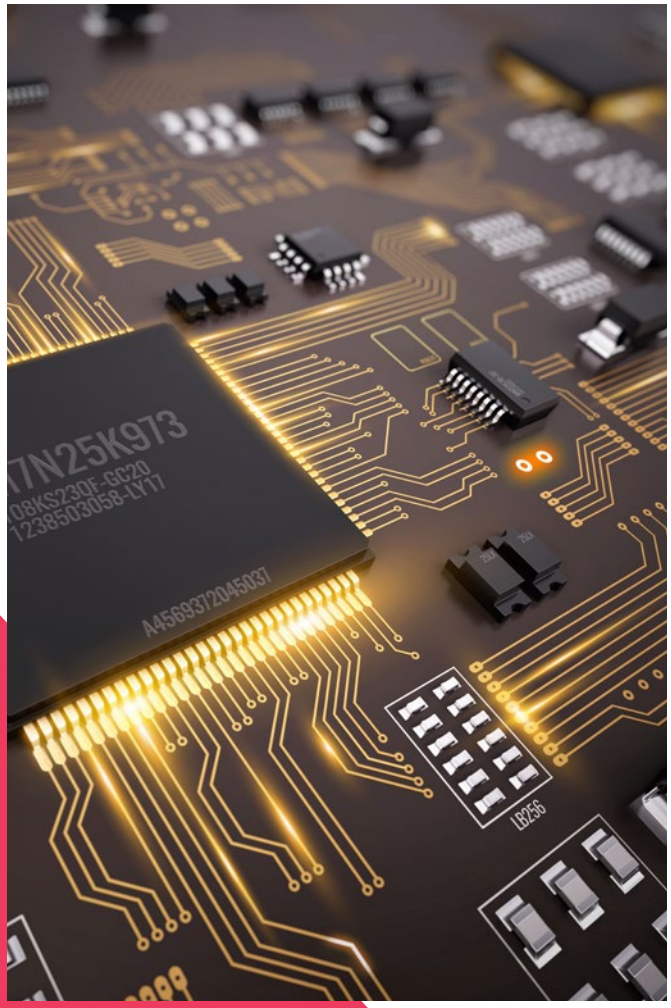
Fluon AH-ETFE fluoropolymer resins, which are supplied in cylindrical pellet form, can be processed using conventional melt processable techniques including extrusion, injection molding, blow molding, compression molding and transfer molding.

ULTRA LOW-MELTING, ADHESIVE RESINS

Fluon LH-8000 is a new addition to the LM-ETFE AH series of adhesive fluoropolymers. This ETFE has a functional group polymerized directly into the chain backbone, allowing it to bond to dissimilar materials, such as polyamides, polyethylenes and metals. The adhesive functionality of the resin is ideal for producing multi-layer structures in a one-step process without surface treatment and by often eliminating the need for a tie layer.

LH-8000 offers the lowest melting point of all the AH series resins, at 180-190 degrees Celsius, and the widest processing temperature range among AGC's Fluon ETFE product lineup between the melting point and the onset of degradation, at 350 degrees Celsius. Corrosive off-gas levels at melt processing are very low, minimizing damage to the molding equipment. A fluoropolymer layer can be co-extruded with conventional engineering plastics such as HDPE and PA without the need for special corrosion-resistant equipment, thereby reducing the initial investment of processors and molders.

LH-8000 has chemical resistance, electrical and non-stick properties equivalent to conventional ETFE resins. However, as an ultra-low melting resin, it is cost-effective for use in applications such as chemical bags, hot water hoses, rubber hose mandrels, anti-stick conveyor belts, multi-layer monofilament, interlayer insulation film for electronic substrates and tubes that convey harsh materials in the chemical, plastics, oil and gas, building and paint industries.



PERFLUORO ADHESIVE RESINS FOR ELECTRICAL APPLICATIONS

As a PFA resin, EA-2000 boasts a high melting point—300 degrees Celsius—and can withstand processing temperatures of up to 380 degrees Celsius while preserving the adhesive functionality of the polymer. Its adhesive functionality facilitates bonding to other materials via a traditional melt-processable method without the need for surface treatment or a separate adhesive layer.

Its superior non-stick and low-friction properties, and water and oil repellency, make it suitable for applications ranging from printed circuit boards (rigid or flexible), heat-resistant insulating tape and laminated tubing, interposers and steel plate laminates.

AN EXPANDING LINE OF ADHESIVE-GRADE FLUOROPOLYMER RESINS AND COMPOUNDS

AGC's newest additions to its adhesive-grade fluorochemicals line provide industry-leading performance across an expanded range of applications in the automotive, oil and gas, chemical, building and construction, packaging and electronics industries. Each is formulated for ease of use within its respective processing environment and is backed by AGC's long-standing reputation as a leading provider of functionalized adhesives.

ABOUT AGC CHEMICALS AMERICAS

For almost a century, AGC Chemicals has been manufacturing high-performance materials serving industrial customers. Already the world's largest, longstanding custom compounder of PTFE and other fluoropolymer resins, AGC continues to build its product line with the introduction of FFKM resins that meet the growing demand for tougher, more durable products for today's production and manufacturing environments.

For full product specifications on our newest high-performance compounding resins, as well as handling and storage instructions, **please visit www.agcchem.com, or alternatively call toll-free (in the U.S.) at (800) 424-7833 to speak with a technical sales representative.**

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