# Viton™ FreeFlow™
Fluoroelastomers

A Guide for Masterbatch Preparation and Handling

## Technical Information

### Introduction

The product line for Viton™ FreeFlow™ consists of an array of polymer process aids designed to meet the needs of the polyolefin industry. The following guide is intended to help those handling Viton™ FreeFlow™ in its pure, undiluted form to safely transform the products into effective masterbatch or finished resin compositions.

### Preparing Effective Viton™ FreeFlow™ Masterbatch

All fluoropolymer process aids function most effectively when, in the final application, the fluoropolymer particles entering the die are in the range of about 2–10 microns in diameter. The degree of dispersion generated during compounding a Viton™ FreeFlow™ masterbatch, therefore, can negatively affect performance if the process aid is too highly dispersed, allowing the fluoropolymer particles to become smaller than 2 microns.

The dispersion of Viton™ FreeFlow™ masterbatch tends to increase as:

- Process aid concentration decreases
- Viscosity of the host resin increases
- Compounding temperature increases
- Mixing energy per unit mass of masterbatch increases

In most masterbatches containing more than about 4% Viton™ FreeFlow™, the fluoroelastomer particles will be larger than 2 microns. When diluted and further processed in the final extrusion application, however, process aids are prone to further dispersion—thereby, losing much of their effectiveness.

Conventional first-generation process aids have been designed for easy dispersion, and the following Viton™ FreeFlow™ product families fall into this category:

Viton™ FreeFlow™ 10, 40, GB, SC, RC

Using these conventional Viton™ FreeFlow™ types, reducing the dispersion generated during compounding may not produce noticeable improvements in process aid performance, as these products readily disperse when let down into the final extrusion process.

To overcome this limitation, Chemours has developed Viton™ FreeFlow™ Z Technology™ and introduced unique and proprietary process aids (i.e., Z100, Z110, Z200, and Z210) that have been designed to resist over-dispersion, and are, therefore, ideal for high mixing applications such as, but not limited to, film, and pipes extrusion using low melt index or fractional melt LLDPE, and HDPE, or in abrasive mixtures containing high levels of mineral fillers or pigments. As a result, masterbatches made from Viton™ FreeFlow™ Z Technology™ process aids may appear to be “undispersed” when compounded using the same techniques used for conventional process aids. In most cases, the additional mixing that occurs when the process aid is diluted in the final extrusion step will bring the dispersion of the Z Technology™ process aid into the ideal 2–10 micron size range needed for optimal performance. When properly dispersed, Z Technology™ process aids can be used at the level of conventional process aids, while providing more reliable performance across a range of formulations and process conditions.

In certain instances, a very coarsely dispersed Z Technology™ masterbatch may cause imperfections in an extrudate caused by fluoroelastomer particles that are too large. In these situations, following the guidelines above can increase dispersion during masterbatch production. Special note should be taken not to rely solely on melt index as an indication of host resin viscosity, because highly shear thinning resins, such as LDPE, generate less mixing than more Newtonian polymers like LLDPE. In general, masterbatches of Viton™ FreeFlow™ Z Technology™ process aids intended to be used directly

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without an intermediate extrusion step (e.g., addition to a pelletizing extruder during resin production) should be produced using the following guidelines:

- Maximum 4% Z Technology™ process aid concentration
- Carrier resin of 5 melt index or less, LLDPE, blend of rich LLDPE/LDPE, HDPE for the Z200 and Z100
- Carrier resin of 10 melt index or less, LDPE, blend of LLDPE/LDPE, PP, EVA for the Z210
- Carrier resin of 10 melt index or less, LDPE, blend of LLDPE/LDPE for the Z110
- Compounding equipment capable of positive conveying and high intensity mixing recommended

## Handling and Processing Safety

Recommended handling practices include:

- Avoid direct contact with skin or eyes. Rinse or wash affected areas.
- Certain Viton™ FreeFlow™ grades are powders; if airborne, these may become nuisance dust or explosion hazards.
- The melting point of components in some grades of Viton™ FreeFlow™ may be as low as 55–60 °C (131–140 °F). Store in a dry environment below 40 °C (104 °F).
- Viton™ FreeFlow™ typical shelf life of 4 years, under normal storage conditions – dry, unopened, temperature below 27 °C (81 °F).

All Viton™ FreeFlow™ products contain fluoropolymers, which may release hydrogen fluoride (HF) if heated above 300 °C (572 °F). While fluoropolymers possess excellent resistance to thermal and oxidative degradation, always maintain good ventilation in areas where molten polymers are processed and minimize exposure to high temperatures. Do not allow Viton™ FreeFlow™ that has been degraded by excessive heat to directly contact skin.

Certain Viton™ FreeFlow™ products, such as RC, Z100 and Z110, contain polyethylene glycol (PEG). Due to the relatively low thermal stability of PEG, special care should be taken when producing Viton™ FreeFlow™ masterbatches containing high levels of PEG (greater than 2%). During compounding, maintain process temperatures below 190 °C (374 °F), and cool pellets below 40 °C (104 °F) before pack-out. The decomposition of PEG is exothermic and may become self-supporting if large containers are packed when the pellet temperature is too high. The auto-decomposition of PEG depends strongly on the levels of PEG, antioxidant, and acidic residuals (e.g., unneutralized catalyst residues) in the product. In addition to reducing the PEG level, ensuring that the final compound is adequately stabilized and neutralized (by adding antioxidants and/or acid scavengers) minimizes the risk associated with PEG decomposition. For typical end-use extrusion applications in which the PEG level in a well-stabilized formula is less than 2%, process temperatures should be maintained below 230 °C (446 °F).

For more information on handling and process safety, refer to the Safety Data Sheet (SDS) for the specific Viton™ FreeFlow™ product in use.

For more information about compounding and using Viton™ FreeFlow™ process aids, contact your Technical Service Representative.

For more information, visit Viton.com



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