



LG Chem NBR

The discovery of copolymerizing butadiene with acrylonitrile (ACN) to yield nitrile elastomers (NBR) is claimed by both Germany in 1930, in an account by Werner Hofmann, and France in a 1931 patent. Commercial nitrile rubber production began in 1935 in Germany. In January 1939 The B.F. Goodrich Co. initiated nitrile production in the United States. These early nitrile elastomers were polymerized at temperatures of 30°C or higher, and are now known as “hot” nitriles. Although by 1948 technology advances allowed polymerization to efficiently occur at temperatures as low as 0°C, but because of practical considerations, polymerization reactions usually occur at 5°C to 10°C. These are referred to as “cold” nitriles.

All commercial nitrile elastomers are made by the emulsion polymerization of 1,3-butadiene and acrylonitrile. The polar acrylonitrile component provides the useful contribution for product applications requiring oil and gasoline resistance, abrasion resistance, gas permeability and thermal stability. The combination of cost effectiveness and performance value is the reason demand for nitrile elastomers has steadily increased through the years.

Basic Composition

In their simplest form, nitrile elastomers are copolymers with acrylonitrile/butadiene monomer ratios in the range of 18/82 to 50/50. The ACN content is one of the two primary criteria for defining every NBR. The ACN level, by reason of polarity, determines several basic properties, such as oil and solvent resistance, low-temperature flexibility, glass transition temperature (T_g), and abrasion resistance. Higher-ACN content provides improved solvent, oil and abrasion resistance, along with higher T_g, while a lower-ACN content improves compression set, low temperature flexibility and resilience.

The other primary criterion is Mooney viscosity, a measure of approximate molecular weight, or toughness. Several specific monomer ratio combina-

tions may be available at several Mooney viscosity levels to suit different processing requirements for the manufacture of the finished rubber article.

During the nitrile manufacturing process, such additional factors as the selection of emulsifier, stabilizer and coagulation systems; tailored molecular weight distribution; and the introduction of a third monomer can further influence processing and performance properties quite significantly.

Elastomer-Related Processability Considerations

Factors affecting the processability characteristics of compounds include the nitrile rubber's acrylonitrile content, molecular weight, polymer architecture, and the types and amounts of non-polymer components present in the elastomer. Polymer architecture includes the extent of branching and gel, the cis, trans, and vinyl butadiene percentages, the molecular weight distribution and the co-monomer distribution.

Acrylonitrile Content

Acrylonitrile content plays a significant role in processing, in addition to end use performance. The acrylonitrile portion of the polymer chain is thermoplastic, while the butadiene portion is more “rubbery”. The higher the acrylonitrile content, the more thermoplastic the nitrile's processing behavior.

Mooney Viscosity

Mooney viscosity is the other most commonly cited criterion for defining nitrile elastomers. It is the current standard physical measurement of the polymer's collective architectural and chemical composition. Mooney viscosity is measured under narrowly defined conditions, with a specific instrument that is fixed at one shear rate. There are an almost unlimited number of ways to modify polymers to derive any given Mooney number, with little assurance of uniformity in the polymer's true architecture.

ADVANCED POLYMER TRADING FZC

19th Floor, Festival Tower

Dubai Festival City, Dubai - UAE

Phone: +971 4 293 2608 Fax: +971 4 293 2525

Website : www.advanced-polymer.com

