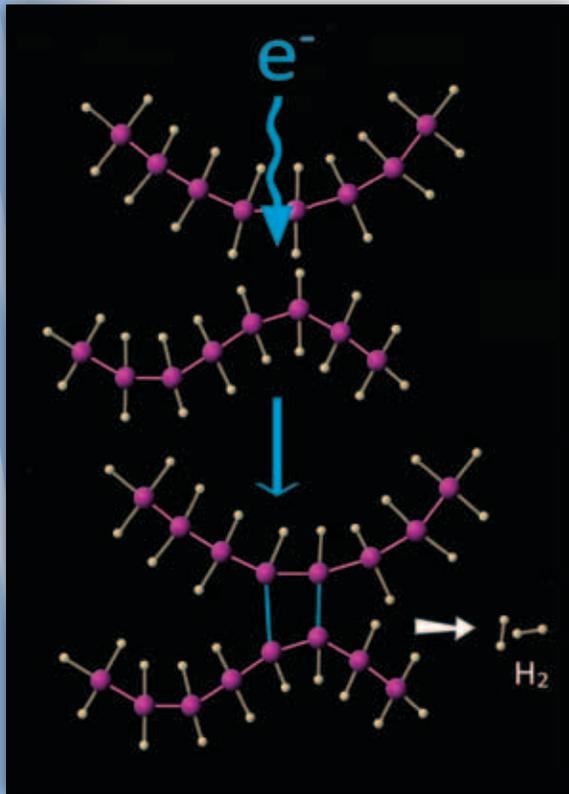




Electron Beam Crosslinking of Polymers

at E-BEAM Services, Inc.

Billions of dollars worth of formed plastic parts, such as heat-shrinkables, plumbing pipe, wire and gaskets, are created each year through the use of electron beam (e-beam) irradiation. E-beam crosslinking is a powerful tool used to improve the properties of a wide range of polymers in the creation of value-added specialty products. Crosslinking significantly improves a variety of properties, including tensile and impact strength, high-heat properties, chemical resistance, abrasion resistance, and environmental stress crack resistance.



How it works

The principle of electron beam technology is similar to that of a television set cathode ray tube. The e-beam accelerator creates a beam of electrons 0.5 inches in diameter and energizes it to near light speed. The beam passes through a scan chamber where a magnet scans it back and forth, creating a curtain of electrons 4 feet wide. A horizontal conveyor carries products under the beam, where an accurate predetermined dose of radiation is delivered.

Why use electron beam processing?

Common chemical crosslinking agents such as peroxides and silanes pose safety concerns and require elevated temperatures to cure. These types of chemical processes can also yield noxious fumes and/or sensitizing by-products and require regulated disposal. Chemical crosslinking processes are affected by a large number of variables and imperfect process control can result in significant product loss.

Conversely, the crosslinking facilitated by e-beam processing does not require using additives nor does it generate hazardous chemical by-products. E-beam crosslinking is energy efficient. Since exposure time of the material to the beam is minimal (seconds), high throughputs are typical. E-beam technology is precisely controlled and the degree of crosslinking is directly related to the level of e-beam exposure.

E-beam crosslinking is suitable for polymers which are difficult to crosslink chemically. Also, environmentally friendly alternatives such as e-beam crosslinked polyethylene can be created to replace less desirable plastics such as PVC.

Finally, e-beam crosslinked plastics are viewed as unadulterated by the FDA, whereas few chemical crosslinking systems are FDA-compliant.

Property enhancements observed in crosslinked polyethylene include increased. . .

- *impact strength*
- *deflection temperature*
- *service temperature*
- *tensile strength*
- *creep and fatigue resistance*
- *stress-crack resistance*
- *abrasion resistance*
- *heat resistance*
- *chemical resistance*
- *solder-iron resistance*
- *barrier properties*

e-beam crosslinkable thermoplastics

- polyethylene (HDPE, LDPE, LLDPE, UHMWPE, etc.)
- fluoropolymers (PVF, ECTFE, PVDF, ETFE, etc.)
- ethylene copolymers (EVA, Surlyn, etc.)
- nylon (PA6, PA6-6, PA12, etc.)
- polybutylene terephthalate (PBT)
- chlorinated polyethylene (CPE)
- polyacrylates
- polyvinyl chloride (PVC)
- and more...

e-beam crosslinkable elastomers

- natural rubber
- synthetic rubber
- silicone rubber
- nitrile rubber
- chlorosulfonated polyethylene (CSPE)
- thermoplastic elastomers
- polyurethane
- polybutadiene
- ethylene propylene diene monomer (EPDM)
- ethylene propylene rubber (EPR)
- styrene butadiene rubber (SBR)
- and more....

Examples of commercial products that use e-beam crosslinking



- wire and cable jacketing
- heat-shrinking products
- gaskets, seals & other molded parts
- piping and tubing
- polyethylene foam sheet
- hydrogels



To contact an E-BEAM Services technical specialist about your crosslinking application . . .
call 1-877-41E-BEAM

In addition to the crosslinking of polymers, E-BEAM Services offers electron beam processing services for rheology control, long chain branching and chain scissioning of polymer pellets, semiconductor enhancement and medical device sterilization.

Why choose E-BEAM Services?

E-BEAM Services, Inc. is a leading supplier of contract electron beam processing services with more than 500 kW of installed accelerator capacity in three processing facilities . . .



Lebanon, Ohio: Two 5.0 MeV accelerators with combined 300 kW of capacity

Cranbury, New Jersey: A 4.5 MeV accelerator with 150 kW of capacity

Lafayette, Indiana: A 1.5 MeV accelerator for wire, cable and tubing e-beam processing



E-BEAM Services, Inc.

Contract Electron Beam Processing

118 Melrich Road
Cranbury, New Jersey 08512
P • 609-655-7460
F • 609-655-3052

2775 Henkle Drive
Lebanon, Ohio 45036
P • 513-933-0031
F • 513-933-0542

P.O. Box 4531
Lafayette, Indiana 47903
P • 765-447-6755
F • 765-449-1085

www.ebeamservices.com