Compounding EPDM with Peroxides

Our website technical session begins with a 3-part series on compounding EPDM with peroxides. We begin with the polymer itself.

Part 1 – Keltan EPDM DSM Elastomers

EPDM and EPR polymers that are peroxide cured have become quite popular as the choice of polymer/cure system as of late. This is because these compounds can be used in many applications where excellent heat resistance and resistance to many fluids is required.

There are three main areas that serve to characterize processing behavior and physical properties of a standard EPDM polymer that is peroxide cured: Diene type/content, Ethylene-Propylene ratio, and Molecular Weight and Distribution.

Diene type/content

There are currently only two different third monomers being used: Dicyclopentadiene (DCPD) and Ethylene norbornene (ENB). It is well known that the allylic hydrogen (the one that is adjacent to the double bond) is most easily abstracted to create a radical that is used to create the crosslink. The DCPD contains three allylic hydrogens and the ENB up to six. The added allylic sites for crosslinking with the ENB gives rise to higher delta torque, modulus, and reduced compression set. The third monomer also can give rise to different structures – DCPD-branched, and ENB-branched or linear dependent on polymerization conditions.

Ethylene-Propylene ratio

If the propylene content is more prevalent and in consecutive order, the structure is then more prone to chain scission which reduces physical properties. Co-agents are then needed. NOTE: This tends to happen in EPR more than EPDM.

Polymer Molecular Weight/ Distribution

The higher molecular weight polymer will be more efficient to create a compound with better physical properties than one with lower molecular weight. The narrow distribution polymer, although more difficult to process, will also have better physical properties than those with broad molecular weight distributions. It is, therefore, best to use polymers that are manufactured using DSM-Elastomers Controlled Long Chain Branching technology which takes advantage of both of these attributes – higher molecular weight and broad molecular weight distribution.

Consequently, to get the best overall properties when peroxide curing an EPDM, use a high molecular weight polymer with a narrow molecular weight distribution that contains a low level of propylene that utilizes ENB as a third monomer.

Check back for Part 2 … GEO Peroxides