

**C9.6****Novel ambient curing and scorch retardant system for moisture crosslinkable polyethylene**

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**Résumé**

Cette étude montre l'effet d'un nouveau système de catalyse, pour l'industrie des câbles basse tension, à base d'acide sulfonique pour les câbles réticulables par voie silane.

Le système réticule le copolymère à base de silane bien plus rapidement que les technologies antérieures. Ceci le rend particulièrement intéressant, non pas uniquement pour une réticulation rapide à température ambiante, mais également en vue d'une réticulation à température et humidité accrues.

Il est montré que le système possède une habilité à l'extrusion plus importante grâce à l'inhibition du phénomène réticulation prématurée, et, à une filière évitant la "barbe d'extrusion" en sortie, permettant ainsi des campagnes d'extrusion plus longues, avec moins de défauts et une surface isolante régulière.

**Abstract**

This study demonstrates a, for the industry, new type of catalyst system for low voltage power cables, based on a compatible sulphonic acid, for silane moisture curable cables.

The system crosslinks silane copolymer much faster than previous technologies and is suitable for crosslinking at ambient conditions as well as curing at higher temperatures and humidity's.

The system has a superior extrudability due to scorch and die drool build up which permits longer extrusion production campaigns with less electrical faults and a smooth insulation surface.

**1. Introduction**

Silane crosslinkable low density polyethylene is widely used as insulation for low voltage power cables throughout the world. It is normally blended with a master batch containing the catalyst prior to being extruded onto the metal conductors. The resulting cable insulation crosslinks on exposure to water producing a tough, flexible and heat resistant electrical insulator [1].

There has been continuous interest in faster curing, stemming from the wish to reduce in process inventories, by wire coaters. When thin wall constructions are being made, it is often possible to coat wire at a very fast rate, only to have reels of wire requiring curing for several hours in hot water tanks, in steam saunas or for weeks at ambient conditions [2].

For the crosslinking process a small addition of a suitable catalyst is necessary to make the crosslinking fast enough. Out of various potential catalysts, the most commonly used catalysts are organotin dicarboxylates especially dibutyltin dilaurate (DBTL).

In order to speed up the crosslinking reaction, recently use of a more active catalyst resulted only in pre-crosslinking in the extruder with unacceptable poor insulation surface and increased electrical faults.

During the 1990's use of a scorch retarder additive (SRA) in the silane system made it possible to increase the activity of the catalysts without pre-curing in the extruders [3][4]. The scorch retarder additive reacts faster than the silane polymer with the water molecule during processing conditions and prevents the crosslinking reaction to occur in the extruder. The time to crosslink was reduced. The curing speed limiting factor was no longer the pre-crosslinking in the extruders but the relatively slow activity of DBTL catalyst in itself.

In order to speed up the crosslinking reaction even more, an extensive screening of different potential catalysts, has been performed. It was found that the fastest suitable catalyst for the silane crosslinkable reaction was special types of compatible sulphonic acids [5]. Furthermore the sulphonic acids are non-volatile and dissolves well in polyethylene and catalyses the