

DEVULCANIZATION OF WASTE TIRE RUBBER BY POWERFUL ULTRASOUND

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ABSTRACT

Ground rubber tire (GRT) is devulcanized in a continuous process where the rubber crumb is conveyed by a screw extruder to a thin gap between a stationary die and a vibrating horn. Ultrasound amplitude, gap thickness and the duration of the treatment are varied, and their effect on the rubber properties is studied. The degree of devulcanization is characterized by the crosslink density and gel fraction of the devulcanized rubber. These characteristics are found to correlate uniquely with each other over a wide range of the treatment conditions. The specific energy of ultrasound consumed per unit mass of the rubber is found to be the operating parameter correlating with the properties of the devulcanized rubber.

The mechanical properties of the re-vulcanized samples reach a maximum with an increasing degree of devulcanization, and then drop as a result of excessive degradation. Even without optimization of cure recipes, tensile strength and ultimate elongation of re-vulcanized tire rubber as high as 10.5 MPa and 250%, respectively, are achieved.