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Use of combination crp-thermal cure in free radical bulk polymerization systems

In a series of studies carried out several years ago, some papers were presented covering the research efforts involved with using Controlled Radical Polymerization techniques in radically cured thermosetting resins. Among the positive attributes that were shown are: improved stability of initiated resins, longer potlife, the ability to create b-staged polyester materials, and most interestingly, the ability to drastically improve mechanical properties. The most noticeable ability of these unique molecules is that property of developing a two-way, reversible, "on-off" type of complex with a growing polymer chain. Since this property is dependent upon the monomeric composition and the processing temperature of the application technique, this particular technology can be used to tailor initiator systems to particular applications and conditions. The overriding question in the middle of these findings is, "what characteristic of these systems causes such changes in mechanical properties?" In this paper, an attempt is made to look mechanistically at the resins created and correlate these improvements to: molecular weight changes, changes in the molecular weight between crosslinks, changes in free volume within the matrix, changes in order/crystallinity within the resin matrix, and changes in crosslink density. It is assumed that through these studies, a better understanding of why radical controllers used in small quantities can make such profound differences in radically cured resins.

Biography

Michael Wells has served in various positions within the polymer industry for 30 years. He has held positions with such organizations as Procter and Gamble, A. O. Smith, Witco, Arkema, and currently holds the position of Director of Research and Development for Reynolds Polymer Technology. He is a graduate of Arkansas State University with a Bachelor's in Chemistry and Lehigh University with an M. Eng. In Polymer Science and Engineering. He was until recently, President of the Rocky Mountain section of the Society for Plastics Engineers, and previously served on the board of the Lehigh Valley section of SPE. His main areas of research are polymer initiation systems and polymer structure/property modification. More recently, he has been working with flame retarded acrylic materials and adhesives. He holds two US patents and 1 application in process. Michael currently resides in Grand Junction, Colorado.

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