SL 6.18

Continuous Monitoring of PVC Crosslinking by Cone and Plate Rheometer

A. Greco (a) A. Maffezzoli (a) and A. Jimenez (b)
(a) Dipartimento di Ingegneria dell'Innovazione. Università degli Studi di Lecce. Via per Arnesano, 73100. Lecce (Italy)
(b) Department of Analytical Chemistry. University of Alicante. Alicante, Spain

Soft PVC is employed for the manufacturing of a wide range of products with different properties and a relatively low cost. The utilization of soft PVC is restricted by the poor thermal, chemical and mechanical resistance properties. Also, plasticizer migration can modify the properties or can make useless the materials for some applications because of toxicity or a general loss of properties. PVC crosslinking is the most effective way to improve mechanical and transport properties of rigid or flexible PVC at high temperatures, but at the same time the thermal stability of PVC may be significantly reduced.
In this work, the crosslinking reaction of plasticized poly(vinyl chloride) (PVC) through difunctional amines was studied. The mechanisms involved in the crosslinking reaction were explained by Fourier transform infrared (FTIR) analysis. The thermal activated crosslinking reaction was studied by cone and plate rheometry, analyzing the evolution of viscoelastic properties of the suspension as a function of time and temperature. The effect of the addition of crosslinking agents on the thermal stability of the polymer was studied by thermogravimetric analysis (TGA), which revealed that crosslinking reactions promote thermal degradation phenomena in the polymer matrix. This is attributed to the formation of HCl and other species promoting polymer degradation during crosslinking, thus leading to higher weight loss during thermal treatment with respect to unmodified PVC plastisols. This was also confirmed by an evident yellowing after crosslinking, especially at higher temperatures.