

44(2):440-478.

[8] Hamed G R. Reinforcement of Rubber[J]. Rubber Chemistry and Technology, 2000, 73(3):524-533.

[9] Hamed G R. Rubber Reinforcement and Its Classification[J]. Rubber Chemistry and Technology, 2007, 80(3):533-544.

[10] Zhang Q, Tian M, Wu Y P, et al. Effect of Particle Size on the Properties of $Mg(OH)_2$ -filled Rubber Composites[J]. Journal of Applied Polymer Science, 2004, 94(6):2341-2346.

[11] Wolff S, Wang M J. Filler-Elastomer Interactions. Part VI.

The Effect of the Surface Energies of Fillers on Elastomer Reinforcement[J]. Rubber Chemistry and Technology, 1992, 65(2):329-342.

[12] Wang M J. Effect of Polymer-Filler and Filler-Filler Interactions on Dynamic Properties of Filled Vulcanizates[J]. Rubber Chemistry and Technology, 1998, 71(3):520-589.

[13] Wang M J. The Role of Filler Networking in Dynamic Properties of Filled Rubber[J]. Rubber Chemistry and Technology, 1999, 72(2):430-448.

收稿日期:2013-01-31

A Novel View of Rubber Reinforcement

LIU Li, ZHANG Fa-zhong, WEN Shi-peng, YANG Hai-bo

(Beijing University of Chemical Technology, Beijing 100029, China)

Abstract: A novel view is proposed that the interaction distance of particles could be used to visually indicate the strength of filler interaction in rubber matrix. There are multilevel interactions (from strong to weak) among particles. The multilevel interaction distances obeys normal distribution. Mechanical and dynamic properties of filled rubber are related to the change of the interaction distance of particles under stress. On the basis of this view, it is simple to accurately analyze and explain some phenomenon of filled rubber, such as the strain hardening in the stress-strain curve, the effect of filler on modulus, the effect of filler on elongation, heat build-up of rubber, temperature rise during the rolling resistance test, and Payne effect of filled rubber.

Key words: rubber; reinforcement mechanism; dynamic property; interaction distance

合成橡胶过剩不可避免

中图分类号:TQ333 文献标志码:D

近年来,随着各国大干快上合成橡胶项目,全球合成橡胶市场供大于求已经不可避免。

顺丁橡胶和丁苯橡胶过剩主要是因为中国近几年对这两个品种大幅扩产,趋于自给自足。安讯思(ICIS)最近发布的《世界合成橡胶市场2012》报告显示,2012年中国顺丁橡胶自给率已达到70%,进口量估计为30万t,而中国丁苯橡胶自给率已达约80%,进口量约为42万t。

业界普遍预计,随着轮胎的绿色化,尤其是在新兴市场,溶聚丁苯橡胶和钕系顺丁橡胶需求将快速增长。德国朗盛公司、韩国锦湖石化公司、中国石油化工集团公司和中国石油天然气集团公司都在继续扩大顺丁橡胶和丁苯橡胶的产能。

生产绿色轮胎通常会增加10%~20%的顺丁橡胶用量,但同时会减少5%~10%的乳聚丁

苯橡胶需求。业内由此认为,全球合成橡胶市场供应过剩局面将进一步恶化。预计到2014年,中国顺丁橡胶和丁苯橡胶的年产能还将分别增加162万和112万t,进一步加剧世界合成橡胶产能过剩和市场竞争程度,进而促进行业加快重组。

产能过剩还将涉及到三元乙丙橡胶和丁腈橡胶,这些橡胶主要用于生产车辆零部件。未来市场竞争将非常激烈,除了有新商家进入之外,更主要的原因是新兴经济体汽车工业快速发展带动全球合成橡胶产能增长的环境正在发生变化。以中国为例,2009年中国汽车销量上涨46%,2010年增长32%,然后市场开始回归理性,2011年销量增长了2.5%,2012年增幅为4.3%。由于汽车拥有量对空气质量和基础设施造成很大压力,未来环境因素将成为制约新兴市场汽车增长的关键因素,也将对全球合成橡胶行业产生一定的负面影响。

(摘自《中国化工报》,2013-03-08)