291–318.
[7] Thomas A G. Rupture of Rubber(II):The Strain Concentration at an Incision[J]. Journal of Polymer Science,1955,18(88):177–188.
[8] Greensmith H W, Thomas A G. Rupture of rubber (III): Determination of Tear Properties[J]. Journal of Polymer Science, 1956,18(88):189–200.
[9] Thomas A G. Rupture of Rubber(V):Cut Growth in Natural Rubber Vulcanizates[J]. Journal of Polymer Science, 1959, 31(123): 467–480.
[10] Lake G J, Lindley P B. Mechanical Fatigue Limit for Rubber[J]. Journal of Applied Polymer Science,2010,9(4):1233–1251.
[11] Mars W V. Cracking Energy Density as a Predictor of Fatigue Life under Multiaxial Conditions[J]. Rubber Chemistry & Technology, 2002,75(1):1–17.
[12] 丁智平,陈吉平,宋传江,等. 橡胶弹性减振元件疲劳裂纹扩展寿命分析[J]. 机械工程学报,2010,46(22):58–64.
[13] 上官文斌,刘泰凯,王小莉,等. 汽车动力总成橡胶悬置的疲劳寿命实测与预测方法[J]. 机械工程学报,2014,50(12):126–132.
[14] 王昊,危银涛. 基于疲劳裂纹扩展理论的轮胎橡胶疲劳寿命预测[J]. 轮胎工业,2016,36(5):259–266.
[15] 李志超,危银涛,金状兵,等. 基于裂纹形核理论的橡胶制品疲劳研究[J]. 弹性体,2014,24(6):28–34.
[16] 刘宇艳,危银涛,杜星文. 橡胶疲劳性能的研究方法[J]. 橡胶工业,1997,44(5):310–312.
[17] 上官文斌,邓建向,余良渭,等. 填充天然橡胶材料裂纹扩展模型的建模方法[J]. 振动、测试与诊断,2016(1):152–159.
[18] 金状兵. 基于开裂能的橡胶动态疲劳寿命预报[D]. 湘潭:湘潭大学,2014.
[19] 上官文斌,王小莉,段小成,等. 变幅载荷下隔振器橡胶材料裂纹扩展试验及建模方法[J]. 机械工程学报,2015(8):50–58.
[20] 陈家照,黄闽翔,王学仁,等. 几种典型的橡胶材料本构模型及其适用性[J]. 材料导报,2015(S1):118–120.

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Design of Fatigue-testing Machine for Rubber Material and Establishment of Fatigue Life Model

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Abstract: The fatigue-testing machine for rubber material was designed, and the fatigue life model was established. Based on theory of crack propagation and the tearing energy, and referencing to national standard GB/T 1688—2008, the fatigue-testing machine for rubber material had been developed. This machine was consisting of actuator, data acquisition system and control system, it was used for rubber material fatigue test and destructive test, and crack propagation rate, tearing energy and destructive energy were obtained. When Yoeh model was adopted as constitutive model, and the tearing energy of the rubber material under different strain was calculated by the finite element method. Then the relationship between crack propagation rate and tear energy was obtained, and fatigue life model was established. This model could be used to predict the life of rubber material with complex ingredients.

Key words: rubber material; fatigue-testing machine; fatigue life; crack propagation; tearing energy

工信部公布第5批符合轮胎翻新行业和废轮胎综合利用行业准入条件的企业名单

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