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Kinetics of Epoxidized Natural Rubber Preparation

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Abstract The epoxidized natural rubbers (ENRs) with different epoxide numbers (*B*) were prepared by suitably increasing the reaction temperature and reducing the formic acid and hydrogen peroxide, the equation of reaction kinetics in ENR preparation was derived from the basic reaction equation and the relationship of *B* to reaction temperature and time, formic acid and hydrogen peroxide level was discussed. The results showed that the reaction in ENR preparation by epoxidizing NR with formic acid peroxide was the first order reaction, and the reaction of NR with hydrogen peroxide was the second order reaction. The resultant reaction rate constant *k*₄ was $1.125 \times 10^{-4} \text{ dm}^3 \cdot (\text{mol} \cdot \text{s})^{-1}$, activation energy was $82.674 \text{ kJ} \cdot \text{mol}^{-1}$; the relationship between *B* and hydrogen peroxide was linear.

Keywords ENR, preparation, kinetics

长效、耐湿、高增粘剂 TKM 系列
研制成功

由北京橡胶工业研究设计院承担的“九五”国家重大科技攻关项目——长效、耐湿、高增粘剂 TKM 系列已完成实验室合成和所具备高性能的试验室评价, 给下一步工业化打下了基础。TKM 系列包括 TKM-M, TKM-T 和 TKM-O 三个产品, 均属非热反应性烷基酚醛树脂。在配加 2 份 TKM 产品的 SBR/NR 未硫化胶料中, 试样经 7 天暴气后, 其自粘性比配加著名的 Koresin 树脂胶料高 50% 以上, 比配加特辛基酚醛树脂和叔丁基酚醛树脂增粘剂的胶料都要高 2 倍以上; 在相对湿度为 98% 的环境下经 80℃×2 h 处理后, TKM 胶料的自粘性比 Koresin 胶料高 20% 以上, 比特辛基酚醛树脂胶料高 1 倍以上, 比叔丁基酚醛树脂胶料高 2 倍以上; 经 80℃×2 h 热处理后, TKM 胶料

的自粘性比 Koresin 胶料高 30% 以上, 比特辛基酚醛树脂胶料高 80% 以上, 比叔丁基酚醛树脂胶料高 1 倍以上。经荣成橡胶厂、桦林橡胶厂、北京轮胎厂、上海载重轮胎厂、河南轮胎厂等 16 个橡胶厂进行小料或大料试验, TKM 表现为具有长效、耐湿的高性能技术特征, 特别表现出两个试片“一碰就扯不开”的高增粘特性。TKM 系列的高新技术特性向橡胶工业展示出它将是各种烷基酚醛树脂最理想的替代品。由于 TKM 的销售价可以与普通烷基酚醛树脂增粘剂持平, 甚至更低, 预计 TKM 将会很快在国内首先形成广阔市场。因其具有高增粘性, 适当降低其配合量, 会给橡胶厂带来经济效益。北京橡胶工业研究设计院已与常州曙光化工厂签订了合作协议, 共同完成 TKM 系列工业化。

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