

## Study on Irradiation Aging of EPDM for Nuclear Power Plants

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**Abstract:** Based on the high irradiation service condition of 1E grade electrical connector in containment of nuclear power plant, the physical and electrical properties of EPDM for nuclear power plants after heavy irradiation were studied, the mechanism of irradiation damage was analyzed, and the mathematical model of irradiation aging of EPDM was established to predict its irradiation aging resistance. The results showed that, with the increase of irradiation dose, the hardness of EPDM increased slightly and the hardening degree was less than 10%, the tensile strength decreased and the rate of decline did not exceed 20%, and the elongation at break decreased significantly. When the cumulative total irradiation dose reached 1.1 MGy, the elongation at break decreased by nearly 60%. According to Arrhenius formula, it was deduced that the logarithm of the elongation at break of EPDM was linearly correlated with the cumulative total irradiation dose. The compression permanent deformation rate of uncompressed EPDM sample decreased after irradiation, indicating that irradiation had a certain effect on improving the compression deformation resistance of EPDM. With the increase of irradiation dose, the dielectric strength of EPDM increased obviously, the volume resistivity increased, and the surface resistivity changed little, indicating that irradiation could improve the electrical insulation performance of EPDM to a certain extent.

**Key words:** EPDM; irradiation; aging; nuclear power plant; mathematical model; compression permanent deformation; electrical insulation performance

### 新型生物基橡胶技术通过中期检查

2019年5月14日,北京化工大学牵头的新型生物基橡胶材料制备技术及应用示范项目通过了科技部高技术研究中心组织的中期检查。

该项目由北京化工大学牵头,联合沈阳化工大学、山东玲珑轮胎股份有限公司、彤程新材料集团股份有限公司等17家单位共同承担。

该项目围绕新型生物基橡胶材料制备及应用技术,开发的强水剪切配合球磨技术与酶解预处理配合溶剂高效提取技术,分别提高了蒲公英橡胶与杜仲橡胶的提胶率和纯度;制备出高相对分子质量、低玻璃化转变温度的生物基衣康酸酯橡胶和生物基共聚酯橡胶;试制出蒲公英橡胶雪地

轮胎、杜仲橡胶全钢载重子午线轮胎、生物基衣康酸酯橡胶轮胎、蒲公英橡胶选矿内衬样片、杜仲橡胶基超耐磨输送带、生物基共聚酯橡胶增韧聚乳酸样品和耐低温密封样品。

项目中期检查采取现场检查和会议交流方式进行。项目专项办和专家组考察了生物基共聚酯弹性体百吨级实验线,听取了项目负责人的中期执行情况汇报。

专家组质询和讨论后认为,该项目达到了预期目标和考核指标,总体进展良好,同意通过中期检查。项目专家还就项目成果凝练、项目合作与衔接、推进项目成员单位之间的协同创新、项目财务管理等方面提出了建议和意见。

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