Preparation and Application of Graphene-modified Silicone Rubber Functional Composites

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Abstract: Graphene-modified silicone rubber composites with excellent overall performance have extensive applications in many fields, such as aerospace, electronics and electrical appliances, as well as medicine and health. In this paper, the main preparation methods of graphene-modified silicone rubber composites and their advantages and disadvantages are summarized, with an emphasis on the research progress of graphene-modified silicone rubber functional composites with surface wettability, thermal conductivity, and electrical conductivity. Improving the efficiency of functional modification of graphene, the graphene content and uniform dispersion of graphene in the composites, and realizing multifunctionality of the composites, are the difficulties and key points of future research in the field of graphene-modified silicone rubber composites.

Key words: graphene; silicone rubber; composite; surface wettability; functional

胶粘剂:行业将迎发展新机遇

近日,国家发展改革委发布的《产业结构调整指导目录(2024年本)》(简称《目录》)明确提到,“低VOCs含量胶粘剂”列入鼓励类条目;“氯丁橡胶类、丁苯热塑性橡胶类、聚氨酯类和聚丙烯酸酯类中溶剂型通用胶粘剂生产装置”列入限制类条目;“107胶(聚乙烯醇缩甲醛胶粘剂)”列入淘汰类条目落后产品。此次《目录》调整将给胶粘剂行业发展带来新机遇和驱动力。

中国胶粘剂和胶粘带工业协会表示,我国胶粘剂和胶粘带行业市场化程度高,市场经济基础牢靠,抗风险能力强。在“双碳”目标和高质量发展战略的指引下,水基型、热熔型、无溶剂型、辐射固化、改性、生物降解等低挥发性有机物(VOCs)含量的胶粘剂产品将得到大力发展。

低VOCs含量的胶粘剂可从3个方面理解。一是《重点行业挥发性有机物综合治理方案》中明确提到的水基型、无溶剂型等低VOCs含量的胶粘剂。二是检测指标应符合GB 33372—2020的各项VOCs含量限量标准。三是企业或生产设施的排放管理应符合GB 37824—2019或GB 37822—2019的排放限值规定。

目前,国内溶剂型通用胶粘剂供应能力过剩。值得注意的是,溶剂型胶粘剂产品在消费电子、5G通讯设备、复合包装材料、压敏胶材料、工业精密制造等特殊领域的需求还无法被其他胶粘剂完全替代。未来,溶剂型胶粘剂的发展方向主要是高端化和功能化,而不是扩大产能。欧美、日本等国家对溶剂型胶粘剂产品还有一定的市场需求,其部分特定市场需求会长期存在。

列入限制类的溶剂型通用胶粘剂生产装置主要针对建筑装饰、鞋和箱包等直接向大气排放VOCs的通用市场。这4种溶剂型胶粘剂产品的溶剂含量较高,是胶粘剂行业VOCs污染的主要来源品种,对其的限制手段主要集中在产能新建、扩建管控方面,以及通过强制性国家标准限制产品的生产排放和VOCs含量。列入淘汰类的107胶的甲醛含量严重超标且粘接强度、抗蠕变性和耐热性能较差,可通过其他环保型胶粘剂来代替107胶。

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