

研究论文

气相色谱-质谱法同时测定聚氯乙烯塑料制品中的10种有机锡化合物

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摘要 采用气相色谱-质谱法(GC-MS)同时快速有效地测定了聚氯乙烯(PVC)塑料制品中的二丁基氯化锡、单丁基氯化锡、三乙基氯化锡、三苯基氯化锡、三丁基氯化锡、三丙基氯化锡、二苯基氯化锡、四丁基锡、二辛基氯化锡和单苯基氯化锡等10种有机锡化合物。使用四氢呋喃溶解PVC样品, 甲醇沉淀样品中的聚合物, 超声萃取其中的有机锡化合物, 将提取液衍生化后用正己烷萃取, 采用GC-MS总离子流和选择离子进行定性定量测定。对衍生化时间、衍生化pH值、衍生化试剂用量、沉淀试剂用量等样品前处理条件进行了优化, 并进行了线性关系、回收率、精密度等考察。结果表明, 方法的线性范围为0.5~50 mg/L, 线性相关系数为0.9978~0.9997。10种有机锡化合物的回收率及相对标准偏差(n=9)分别为84.23%~109.1%和4.24%~10.75%。所建立的方法能很好地应用于PVC塑料制品中有机锡化合物的检测。

关键词 [气相色谱-质谱法](#) [有机锡化合物](#) [聚氯乙烯塑料](#)

Simultaneous determination of ten organotin compounds in polyvinyl chloride plastics using gas chromatography-mass spectrometry

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Abstract

A rapid and effective gas chromatography coupled with mass spectrometry method has been developed systematically and studied for the simultaneous determination of 10 organotin compounds, dibutyltin-dichloride (DBT), n-butyltin-trichloride (MBT), triethyltinchloride (TET), fentin-chloride (TPhT), chlorotributylstannane (TBT), tri-n-propyltinchloride (TPrT), diphenyltin-dichloride (DPhT), tetrabutyltin (TeBT), di-n-octyltin-dichloride (DOT), phenyltin trichloride (MPhT)), in polyvinyl chloride (PVC) plastics. The PVC sample was dissolved with tetrahydrofuran and the polymer in the sample was precipitated with methanol, and then the target compounds were derivatized with sodium tetraethylborate and extracted with hexane under ultrasonication. The qualitative and quantitative analysis were carried out by GC-MS and the total ion chromatogram and selected ion chromatogram were obtained. The derivatization and extraction conditions, such as the derivatization time, derivatization pH value, dosages of derivatization reagent and precipitation reagent were optimized. The good linearities, recoveries and precisions were obtained. The linearity ranges were 0.5-50 mg/L. The linearity correlation coefficients of 10 organotin compounds were between 0.9978 and 0.9997. The average recoveries were 84.23%-109.1% with relative standard deviations of 4.24%-10.75%. The established method has been successfully applied to the determination of organotin compounds in PVC plastics.

Key words [gas chromatography-mass spectrometry \(GC-MS\)](#) [organotin compounds](#) [polyvinyl chloride plastics](#)

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