

## 论文

### 电喷雾萃取电离质谱快速测定牙膏胶体中的二甘醇

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#### 摘要:

将自行研制的电喷雾萃取电离源(EESI)和LTO XL质谱仪耦合, 建立了选择性离子化快速测定牙膏胶状纳米级复杂基质样品中微量二甘醇的EESI-MS方法. 实验结果表明, 二甘醇与 $\text{NH}_4^+$ ,  $\text{Na}^+$ 和 $\text{K}^+$ 离子在一级质谱中形成特征非共价配合物, 其它大量组分如纳米粒子及胶质等对测定无干扰. 该方法的样品消耗量约0.1 g, 灵敏度高, 单个样品的分析时间不到2 min, 可用于牙膏胶体中低含量二甘醇的选择性快速测定.

关键词: 电喷雾萃取电离; 质谱; 牙膏; 二甘醇; 快速测定; 分子-离子反应

### Rapid Quantitative Detection of Toxic Diethylene Glycol in Toothpaste by Extractive Electrospray Ionization Ion Trap Mass Spectrometry

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#### Abstract:

Using ammonium acetate methanol solution(10  $\mu\text{mol/L}$ ) as the spray solvent, a novel method based on reactive extractive electrospray ionization(EESI) ion trap mass spectrometry was developed for the rapid determination of diethylene glycol(DEG) in toothpaste products, which are typical colloidal complex samples containing nano-scale particles in matrices. Under the optimized working conditions, DEG formed non-covalently bound complexes with  $\text{NH}_4^+$ ,  $\text{Na}^+$  and  $\text{K}^+$  rather than the protonated molecules in the mass spectrum. About 0.1 g of the toothpaste products were required for direct sensitive analysis with EESI-MS, the whole procedure was completed within less than 2 min. Furthermore, the qualitative demonstration and quantitative analysis of DEG of the paste products was also done by the EESI-MS and EESI-MS/MS spectra. This method can be used for the rapid and selective determination of low-level DEG in toothpaste products, and it is a useful method for the rapid determination of low-level components in the viscous nano-materials.

Keywords: Extractive electrospray ionization; Mass spectrometry; Toothpaste; Diethylene glycol; Rapid detection; Ion/molecule reaction

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