

固相萃取-离子色谱/气相色谱-质谱法联合检测油田水中的有机酸和酚类化合物

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Determination of organic acids and phenols in oil field water by solid phase extraction-ion chromatography and gas chromatography-mass spectrometry

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摘要 建立了固相萃取-离子色谱(IC)/气相色谱-质谱(GC-MS)联合检测高矿化度油田水中低相对分子质量的有机酸和酚类化合物的方法。在中性pH条件下,样品经Waters Oasis HLB柱萃取后,萃取液经稀释、Ag₂O沉淀和Ag-H柱处理除去大部分氯离子,再用IC测定有机酸;将萃取柱真空冷冻干燥,然后经甲基叔丁基醚/甲醇(9:1, v/v)脱附并用无水硫酸钠除水,再用GC-MS检测酚类化合物。在优化的实验条件下,4种低相对分子质量的有机酸以及5种酚类化合物的平均加标回收率达到80%以上,相对标准偏差(RSD, n=6)为2.38%~9.45%,定量限均低于88.9 μg/L。该方法测定结果准确可靠,适用于氯离子含量高达150 g/L左右水样中低相对分子质量的有机酸和酚类化合物的检测。

关键词: 固相萃取 离子色谱法 气相色谱-质谱法 有机酸 酚类化合物 油田水

Abstract: A method was developed for the determination of low relative molecular mass organic acids and phenols in oil field water with high salinity by ion chromatography (IC) and gas chromatography-mass spectrometry (GC-MS) respectively after solid phase extraction. The experiment showed that organic acids can be well separated from phenols by a Waters Oasis HLB column under neutral pH condition. The former was quantitated by IC after effective removal of chloride by Ag₂O and Ag-H columns; and the later was quantitated by GC-MS after the desorption by methyl tertiary butyl ether (MTBE)/methanol (9:1, v/v) and the dehydration by freeze-drying together with anhydrous sodium sulfate. The average recoveries of added standards were more than 80%. The relative standard deviations (RSDs, n=6) were between 2.38% and 9.45%, and all the quantitative limits were less than 88.9 μg/L. The results prove that this method is suitable for the determination of low molecular mass organic acids and phenols in water samples with the chloride content up to 150 g/L.

Keywords: solid phase extraction (SPE) ion chromatography (IC) gas chromatography-mass spectrometry (GC-MS) organic acids phenols oil field water

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