Application Note AN-K-074

用卡尔费休滴定法测定原油中的含水量

Fully automated determination using the oven method according to ASTM D4928

Crude oil contains water. Before transport, water is removed to reduce costs. Furthermore, the presence of water in crude can cause corrosion. Therefore, it is essential to determine the water content in crude oil.

Previously, ASTM D4928 described a direct coulometric Karl Fischer titration to determine water in crude oil. This quickly contaminated the titration cell, requiring regular cleaning and frequent reagent exchange. ASTM D4928 was then revised to include coulometric Karl Fischer titration in combination with the oven method. In this method, the sample is heated in an oven. The water evaporates and is carried into the titration cell by an inert carrier gas. The water content is determined in the titration cell.

The oven method avoids titration cell contamination and significantly reduces reagent consumption. It can be fully automated, minimizing handling errors and workloads, with outstanding reproducibility.

SAMPLE AND SAMPLE PREPARATION

The method is demonstrated for three different crude oil types. The samples are homogenized before being filled into sample vials.

EXPERIMENTAL

This analysis is carried out on an automated system consisting of an 874 Oven Sample Processor and an 851 Titrando equipped with a coulometric titration cell (Figure 1).

Figure 1. The 874 Oven Sample Processor, 851 Titrando and coulometric titration cell, all controlled by tiamo software.

RESULTS

The analysis demonstrates acceptable results and well-defined titration curves. The results for the three different crude oil samples are shown in Table 1. An example titration curve is displayed in Figure 2.

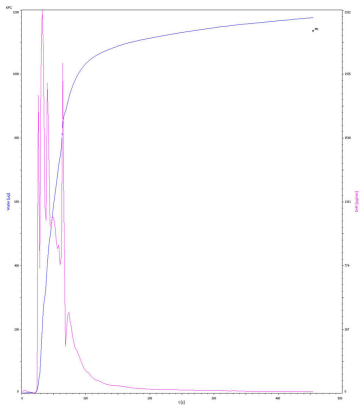

Figure 2. Example titration curve of the water content determination in crude oil.

Table 1. Results for the water content determination in crude oil according to ASTM D4928.

Water content (n = 4)	Mean in µg H_2O/g sample	SD(rel) in %
Sample 1	853	2.09
Sample 2	4865	0.44
Sample 3	41111	0.43

CONCLUSION

The oven method is the perfect option to determine water content in crude oils precisely and reliably.
Using the 874 Oven Sample Processor allows fully automated determination, freeing up valuable time and thus increasing laboratory productivity. Furthermore, by fully automating the analysis, the reproducibility can be increased and sample analysis failures due to improper handling can be reduced.

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CONFIGURATION

874 Oven Sample Processor

874 Oven Sample Processor 用于在卡尔·费休滴定中自动进行热化样品前处理。炉式方法特别适合于那些在较高温度下方可析出水份的样品、以及难溶样品或与 KF 试剂起反应的样品。

851 Titrando

库仑法卡尔费休水分测定仪包括带隔膜的发生电极和801搅拌器。

对于痕量水分(10 µg-10 mg 绝对水量)的测定来说,库伦分析法是用于液体、固体和气体中水分测定的理想方法。此外,库伦分析法是一种绝对方法,因此无需进行滴定度测定。

使用 851 Titrando 可简便快捷地进行库伦法滴定。

建议的测量范围:10 µg-200 mg绝对水量

使用 OMNIS软件、tiamo软件或触摸屏控制。如果需要,可满足 GMP、GLP 和 FDA 要求,比如 21 CFR Part 11。