青岛创梦仪器有限公司

Qingdao ChuangMeng Instrument Co., Ltd.

毛细管吸收时间测定仪

Capillary Suction Timer

Model:1704

使用手册

Instruction Manual

版本 1.0

Version 1.0

请你仔细阅读《使用手册》，正确掌握本产品的安装和使用方法。阅读后请将本《使用手册》妥善保管，以备今后进行检修和维护时使用。

Carefully read this User Manual to learn how to install and use the product correctly. After reading, properly keep the User Manual as a reference for future maintenance and repair.

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一、概述 Introduction

创梦仪器生产的毛细管吸收时间测定仪可用于多个领域，如污水处理（快速测试污泥过滤特性和状态）、油田化学处理剂测试和研究（评价泥浆抑制分散性能力、钻井液的防膨胀能力、钻井液的抑制水化分散能力、优化入井工作液配方，如处理剂种类、用量及配比等，也可作为分析、评价页岩分类的新方法）。

The capillary absorption time measuring instrument produced by Chuangmeng Instrument can be used in multiple fields, such as sewage treatment (rapid testing of sludge filtration characteristics and status), testing and research of oilfield chemical treatment agents (evaluating the ability of mud to inhibit dispersion, anti swelling ability of drilling fluid, inhibition of hydration dispersion ability of drilling fluid, optimizing the formula of the working fluid entering the well, such as the type, dosage and ratio of treatment agents, etc., and can also be used as a new method for analyzing and evaluating shale classification).

二、技术参数 Parameter

名称 Name	技术参数 Parameter
滤失面积 Filtration area	(4580±60)mm^2
工作压力 working pressure	100psi(690±35)kPa
外形尺寸 External dimensions	152×140×76

三、结构及工作原理 Structure and Principle

（一）组件 Components

包括了计时器、不锈钢的圆筒、测试探头等，不锈钢的圆筒一头直径 1 厘米，另一头直径 1.8 厘米。

It includes a timer, stainless steel cylinder, test probe, etc. The stainless steel cylinder has a diameter of 1 centimeter at one end and 1.8 centimeters at the other end.

（二）工作原理 Working principle

毛细管吸收时间测定仪测定各种试液与页岩粉配成的浆液渗过特制滤纸一定距离所需的时间，此值称为 CST 值。它的大小与液体的性质，胶体的分散性等因素有关，可用于判定泥页岩在水中的胶态分散程度。CST 值越小抑制效果越好，其最小值表明：

The capillary absorption time analyzer measures the time required for various test solutions and shale powder slurries to permeate a certain distance through specially designed filter paper. This value is called the CST value. Its size is related to factors such as the properties of the liquid and the dispersibility of colloids, and can be used to determine the degree of colloidal dispersion of shale in water. The smaller the CST value, the better the inhibitory effect, and its minimum value indicates that:

1、最小的页岩水化效应；

The minimum shale hydration effect;

2、最小的胶体分散;

Minimum colloidal dispersion;

3、最低的页岩活性。

The lowest shale activity.

四、操作 Operate

（1）试样制备 Sample preparation

1、收集岩样，最好直径大于 6.4mm。

Collect rock samples, preferably with a diameter greater than 6.4mm.

2、用淡水清洗岩屑。

Clean the rock debris with fresh water.

3、用 3%（质量分数）H_2O_2溶液强烈搅拌已用淡水清洗好的岩屑。

Strongly stir the rock debris that has been cleaned with fresh water using a 3% (mass fraction) H2O2 solution.

4、在（105±3）℃的恒温干燥箱内干燥已清洗好的岩屑 2h。

Dry the cleaned rock fragments in a constant temperature drying oven at (105 ± 3) ℃ for 2 hours.

5、用粉碎机研磨已干燥好的试样。

Grind the dried sample with a grinder.

6、将试样过 100 目标准分样筛后，装入广口瓶备用。

After passing the sample through a 100 mesh standard sieve, put it into a wide mouthed bottle for later use.

（2）页岩水化分散试验 Shale hydration dispersion test

1、定量称取 7.5g 过 100 目筛的页岩试样，倒入不锈钢杯中，加入蒸馏水至 50ml。

Quantitatively weigh 7.5g of shale sample passing through a 100 mesh sieve, pour it into a stainless steel cup, and add distilled water to 50ml.

2、将装有试样的杯置于瓦楞混合器上，在 3 挡速度下，搅拌 20s。

Place the cup containing the sample on the corrugated mixer and stir at 3 speeds for 20 seconds.

3、用不带针头的注射器（5ml）取出 3ml 浆液并压入 CST 圆柱试浆容器中。

Take out 3ml of slurry using a syringe without a needle (5ml) and press it into a CST cylindrical slurry testing container.

4、测定并记录 CST 值。

Measure and record CST values.

5、将剩余的浆液继续在 3 档速度下，分别搅拌 60s 和 120s 并测定其 CST 值（即各重复该段中 3 步和 4 步）。

Continue stirring the remaining slurry at three different speeds for 60 seconds and 120 seconds respectively, and measure its CST value (i.e. repeat steps 3 and 4 in each section).

6、用 20s、60s、120s 作为 X 值，对应的 CST 值作为 Y 值，并代入线性回归。

Use 20s, 60s, and 120s as X values, corresponding CST values as Y values, and substitute them into linear regression.

7、计算 Y=mX+b 中的斜率 m，截距 b 值及相关系数 R，并做 CST—T 曲线图。T 为搅拌时间。回归方程 Y=mX+b 中，Y 即 CST 值，m 即直线的斜率，CST 值随剪切时间的变化而变化，可用来表征水化分散的速度。b 是 CST 轴上的截距，是由 CST

—T 曲线外延而得到的。

Calculate the slope m, intercept b, and correlation coefficient R in Y=mX+b, and plot the CST-T curve. T is the stirring time. In the regression equation Y=mX+b, Y represents the CST value, m represents the slope of the line, and the CST value varies with shear time, which can be used to characterize the speed of hydration dispersion. B is the intercept on the CST axis, which is derived from the extension of the CST-T curve.

一般认为，b 越大，瞬时破裂下来的胶体颗粒越多；m 越大，水化分散的速度越快，反之亦然。

It is generally believed that the larger b, the more colloidal particles will break down instantly; The larger the m, the faster the hydration and dispersion speed, and vice versa.

（3）泥浆的分析、评价和分类 Analysis, evaluation, and classification of mud

CST 仪可用于作为分析、评价和提出页岩分类新方法的仪器，如图所示，它用来测定页岩的分散性。CST 装置由过滤漏斗(直径约 2.54cm、高 5～6cm 的不锈钢圆筒)、标准孔隙度滤纸、计时器及与之相连的电极组成。电极距漏斗边缘分别为 0.5cm、1.0cm 和 1.5cm。

The CST instrument can be used as an instrument for analyzing, evaluating, and proposing new methods for shale classification, as shown in the figure. It is used to determine the dispersibility of shale. The CST device consists of a filtering funnel (a stainless steel cylinder with a diameter of about 2.54cm and a height of 5-6cm), standard porosity filter paper, a timer, and electrodes connected to it. The distance

between the electrodes and the edge of the funnel is 0.5cm, 1.0cm, and 1.5cm, respectively.

CST 装置进行页岩分散试验程序如下：将 15%的 100 目页岩浆液在恒速下剪切不同的时间，漏斗置于标准滤纸上，滤纸覆盖带电极的试验板。取 5ml 搅拌好的浆液倒入漏斗中，测定浆液在滤纸上流动 0.5cm 距离所需的时间。同一试验至少应进行三次，其误差不超过 3%～5%。

The shale dispersion test procedure for CST device is as follows: 15% of 100 mesh magma solution is sheared at a constant speed for different times, the funnel is placed on standard filter paper, and the filter paper covers the charged electrode of the test plate. Take 5ml of stirred slurry and pour it into a funnel. Measure the time required for the slurry to flow on filter paper for a distance of 0.5cm. The same experiment should be conducted at least three times, with an error not exceeding 3% ～ 5%.

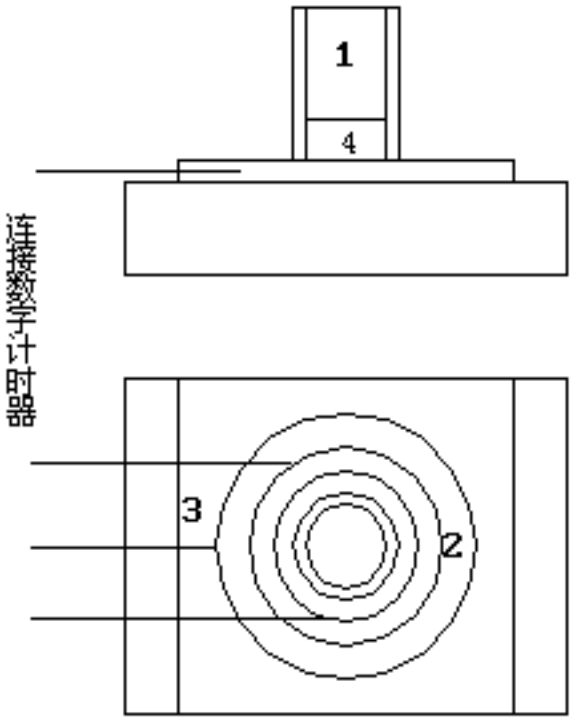

图 1 CST 装置原理图

1、过滤漏斗 2、滤纸 3、电极 4、浆液

为了评价不同电解质对页岩的作用，制备 CST 试验样品时，要求用蒸馏水冲洗页岩岩屑，直至水中无氯离子存在为止，然后再将岩屑烘干。

In order to evaluate the effect of different electrolytes on shale, when preparing CST test samples, it is required to rinse shale rock fragments with distilled water until there are no chloride ions present in the water, and then dry the rock fragments.

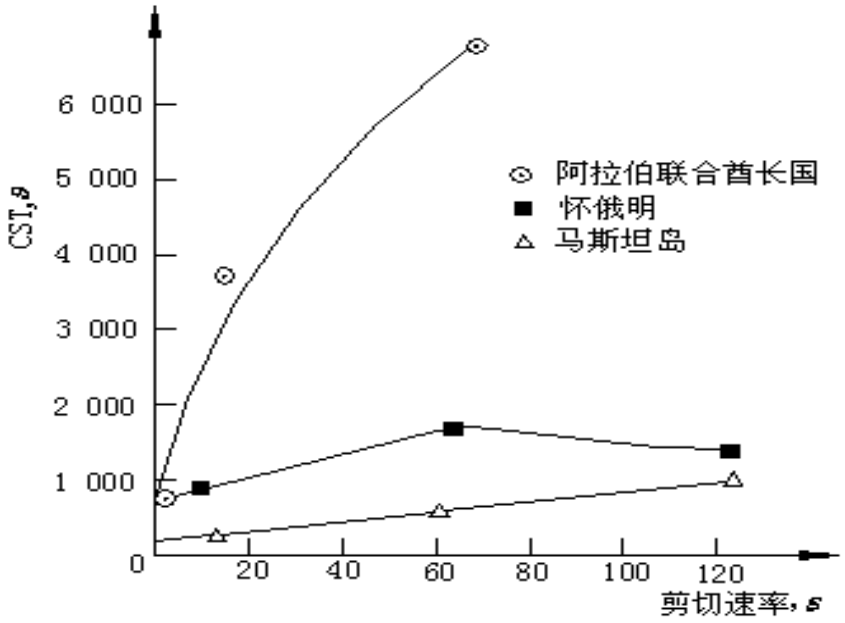

图 2 三种页岩的 CST 分散性试验曲线

图 2 所示为三种页岩的 CST 分散性试验曲线。图中 CST 值与剪切时间呈线性关系，因此，页岩分散性方程可表达为:

The CST dispersion test curves of three types of shale are shown in Figure 2. The CST value in the figure is linearly related to the shear time, therefore, the shale dispersion equation can be expressed as:

$$y=m_1x+B$$

式中:y--浆液渗透 0.5cm 举例所需的时间 s；m_1--斜率,表示页岩在溶液中的分

散速度；x--剪切时间,s；B--截距,表示瞬时细分散的胶体粒子量(初分散)。

Where: y - the time required for the slurry to penetrate 0.5cm, for example, s; M1- Slope, representing the dispersion rate of shale in solution; X - shear time, s; B - intercept, represents the instantaneous fine dispersion of colloidal particles (initial dispersion).

（4）页岩的分析、评价和分类 Analysis, evaluation, and classification of shale

CST（Capillary Suction Timer ）的测试是表现污泥过滤性和状态的一个快速和可靠的方法，它于 1970 年起已被国外广泛应用。污泥的过滤性影响着几乎所有不同类型的脱水设备的输出量，这些设备包括：干化床，压带机，真空过滤器，压滤机和离心分离机等。

The CST (Capillary Filtration Timer) test is a fast and reliable method for demonstrating the filtration performance and state of sludge, and it has been widely used abroad since 1970. The filtration performance of sludge affects the output of almost all types of dewatering equipment, including drying beds, belt presses, vacuum filters, filter presses, and centrifugal separators.

通过标准滤纸产生的毛细吸水压力用于从污泥中“吸收”水分，水分渗入滤纸的速率的改变依靠污泥的状态和在滤纸上形成的泥饼的过滤性，CST 从漏斗上的两个以标准间隔放置的电极上获取。得到的从开始到通过这两个电极间的时间即为 CST。

The capillary suction pressure generated by standard filter paper is used to "absorb" water from the sludge, and the rate of water infiltration into the filter paper depends on the state of the sludge

and the filtration properties of the sludge cake formed on the filter paper. CST is obtained from two electrodes placed at standard intervals on a funnel. The time obtained from the beginning to passing between these two electrodes is called CST.

在漏斗中通过毛细吸水产生的力量远远大于流体静压的顶点，所以测试不依赖污泥的数量。只要有污泥就可产生 CST。

The force generated by capillary water absorption in the funnel is much greater than the peak of fluid static pressure, so the test does not depend on the amount of sludge. As long as there is sludge, CST can be produced.

五、维护与保养 Maintenance and upkeep

1、清洗各部件并干燥待用，仪器置于干燥环境中。

Clean and dry all components for later use, and place the instrument in a dry environment.

2、移动或保养仪器时。要轻拿、轻放，以免造成部件变形影响精度和使用。

When moving or maintaining instruments. Handle with care to avoid deformation of components that may affect accuracy and usability.

青岛创梦仪器有限公司 装箱单
Qingdao Chuangmeng Instrument Co., Ltd. Packing list

生产企业：青岛创梦仪器有限公司
Manufacturing enterprise: Qingdao Chuangmeng Instrument Co.,Ltd.

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Production address: No. 3 Xinghai Road, Liuting Street, Chengyang District, Qingdao

主机型号:
Model of the main motor:

出厂编号：
Manufacturing No:

序号	编号	名称及规格	单位	数量
1	1730	测试主机	套	1
2	1730108	专用滤纸	30/盒	4
3	1730101	漏斗	个	1
4		注射器，5mL 针头	支	2
5	1730102	测试探头	个	1
6		使用手册	份	1
7		合格证	份	1

产品合格证

Product Quality Certificate

出厂编号：
Manufacturing No:

产品名称： Description:	
产品型号： Model:	
检验标准： Standard:	
生产日期： Date of Manufacture:	
产品编号： Product Code:	

结论：Conclusion:

经检验，青岛创梦仪器有限公司生产的产品符合上述标准的要求。准予出厂。
After inspection,Qingdao Chuangmeng Instrument Co., Ltd The products produced meet the requirements of the above standards. Approved for delivery.

本企业通过： ISO014004 环境管理体系认证；
ISO9001:2015 质量管理体系认证；
ISO18000 职业健康安全管理体系认证质检科；

QC Department: