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Potassium Ion Test Kit

Part No. #147-90

Instruction Manual

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Intro

Potassium muds are a class of drilling fluid that contain Potassium ion (K^+) dissolved in the water phase. Potassium muds are widely accepted for drilling shales that will expand in the presence of water, especially hard, brittle shales. K^+ ions attach to the clay surfaces and lend stability by helping to repress swelling in shale that has been exposed to drilling fluids. The ions also help hold the cuttings together thereby minimizing dispersion into finer particles which can lead to various rheology problems. The presence of Sodium (Na^+) ions counteracts the benefits of K^+ ions and should be minimized by using fresh water (not sea water) for make-up water.

Potassium Chloride (KCl) is a clear brine fluid and the most widely used potassium source. Additionally potassium acetate, potassium carbonate, potassium lignite, potassium hydroxide, and potassium salts of PHPA are also used. Use of Bentonite clay is restricted because of its strong affinity for K^+ . Instead, various polymers are used. XC polymer and PHPA are used for rheology and for fluid-loss control, mixtures of starch and polyanionic cellulose are often used. Potassium Chloride is also routinely used for cement slurry applications. By preventing clay swelling it helps improve the cement / formation bond and is effective at temperatures between 50°F and 380°F (10°C and 193°C). Additionally KCl slightly accelerates slurry setting time.

Several methods exist for determining the K^+ ion concentration, but the centrifuge method (for $K^+ > 5,000$ mg/L) is the most accepted field method, and is essential for daily monitoring of potassium in a mud. K^+ ion is rapidly consumed while drilling shallow, soft, and highly dispersive (gumbo) shales, and therefore needs to be regularly added. Maintaining sufficient K^+ ion to stabilize gumbo can become expensive when drilling large holes. Potassium muds above about 1 wt. % K^+ ion usually fail the Mysid Shrimp (US EPA) bioassay test. Therefore Potassium muds currently find low acceptance in offshore drilling in USA waters, particularly in the Gulf of Mexico.

The Potassium Strip test kit is suitable as a rapid guiding test of potassium in drilling fluids, drinking water, mineral water, wastewater, and extracts from soil samples, wine, beer and fruit juices, etc. A particular advantage of the procedure is that potassium can be semi-quantitatively determined in the presence of 10 times its amount of sodium. The strips operate on the principle that in alkaline solutions the reagent dipicrylamine forms an orange-colored complex with potassium ions which is fixed on the test zone by treating with 0.7% (0.1N) Nitric Acid.

The color scale is graduated as follows:

0 - 300 - 700 - 1,000 - 2,000 mg/L (ppm) K^+

Safety

1. Always wear safety glasses when conducting any laboratory test.
2. Always wear a protective lab coat.
3. Wear protective gloves.
4. Before running a test, make sure you fully understand the test procedure.
5. Any acid is a hazardous item, even one as weak as 0.1N.
6. Do not pipette by mouth.
7. Avoid working alone.
8. No eating, drinking, smoking, or applying cosmetics or lip balm in the laboratory area.
9. The laboratory must have a work area containing a sink for washing hands and a readily available eyewash facility.
10. Know where things are: The nearest fire extinguisher, fire alarm box, exits, telephone, eyewash station, first aid kit, etc.
11. Get a good night of sleep before running any laboratory test.

Procedure

1. Place a test tube into the cavity of the thermoformed lining and fill it with 10 drops of Potassium - Nitric Acid, 0.7%, (0.1N).
2. Remove only as many potassium test sticks as are required, and reseal the container immediately after use. Do not touch the test paper zone.
3. Dip a test stick briefly into the solution to be tested so that the reaction zone is completely moistened. Shake off any excess liquid.
4. Place the test stick into the test tube filled with the 0.7% Nitric Acid and leave it there for 1 minute. Do not move the test strip while it is immersed in the acid.
5. After 1 minute remove the test stick and compare the test paper zone with the color scale. In the presence of potassium the test paper turns yellow to orange-red.

Appendix

Remarks

1. Avoid exposing the sticks to sunlight and moisture. Store the kit below 86°F (30°C) in a dry place.
2. The detection is not disturbed by less than 3000 mg/L of sodium ions. In the pH range of 5 - 14 the accuracy of the detection is independent of the pH of the solution to be tested. If the solution to be tested has a pH below 5, mix 5 mL of solution with a spatula-tipful of Lead (II) Carbonate GR. The pH should then be 5, followed by a spatula-tipful of Cadmium Powder. Let stand a few minutes and test for potassium as described.

Interferences and Influences of Other Cations

More than 3,000 mg/L concentrations of sodium ions may cause low results. The following concentrations of ions do not interfere:

- < 1,000 mg/L Al^{3+} , Ba^{2+} , Ca^{2+} , Fe^{2+} , Fe^{3+} , Mg^{2+} , Mn^{2+} , Sr^{2+} , Zn^{2+}
- < 200 mg/L NH_4^+ , Hg^+ , HG^{2+} , Tl^+
- < 25 mg/L S^{2-}

Sodium ions are only interfering if a yellow precipitation occurs when 2 mL of sample, which is either neutral or acidified with acetic acid, are mixed with 2 mL of Zinc Uranyl Acetate solution. Mix this solution by dissolving 9 grams of Uranyl Acetate GR and 9 grams of Zinc Acetate GR together with 2 mL of Glacial Acetic acid GR in 65 mL of water.

Separation of Sodium Ions

Convert 1 gram of strong-acid cation ion exchanger to the H^+ form with 50 mL of 2N HCl. Wash neutral with water and allow 5 mL of the sample solution to run slowly (1 drop/second) through the ion exchanger. Wash out the Sodium ions with 50 mL of 0.5N HCl, neutralize the eluate with 1 gram of anion exchanger converted to the OH form, and test for potassium with the test strip after the first few drops have passed through.

Adjust 2 mL of sample solution to a pH of 5 - 6 with about 2 drops of Glacial Acetic acid GR. Add 2 mL of the Zinc Uranyl Acetate solution described, filter, and neutralize with Lead (II) Carbonate GR. As soon as the solution has stopped foaming, add about 0.2 grams of Cadmium powder and shake for about 10 minutes. Allow it to settle and use the test strip to determine the potassium concentration in the clear supernatant solution.

Warranty and Return Policy

Warranty:

OFI Testing Equipment, Inc. (OFITE) warrants that the products shall be free from liens and defects in title, and shall conform in all respects to the terms of the sales order and the specifications applicable to the products. All products shall be furnished subject to OFITE's standard manufacturing variations and practices. Unless the warranty period is otherwise extended in writing, the following warranty shall apply: if, at any time prior to twelve (12) months from the date of invoice, the products, or any part thereof, do not conform to these warranties or to the specifications applicable thereto, and OFITE is so notified in writing upon discovery, OFITE shall promptly repair or replace the defective products. Notwithstanding the foregoing, OFITE's warranty obligations shall not extend to any use by the buyer of the products in conditions more severe than OFITE's recommendations, nor to any defects which were visually observable by the buyer but which are not promptly brought to OFITE's attention.

In the event that the buyer has purchased installation and commissioning services on applicable products, the above warranty shall extend for an additional period of twelve (12) months from the date of the original warranty expiration for such products.

In the event that OFITE is requested to provide customized research and development for the buyer, OFITE shall use its best efforts but makes no guarantees to the buyer that any products will be provided.

OFITE makes no other warranties or guarantees to the buyer, either express or implied, and the warranties provided in this clause shall be exclusive of any other warranties including ANY IMPLIED OR STATUTORY WARRANTIES OF FITNESS FOR PURPOSE, MERCHANTABILITY, AND OTHER STATUTORY REMEDIES WHICH ARE WAIVED.

This limited warranty does not cover any losses or damages that occur as a result of:

- Improper installation or maintenance of the products
- Misuse
- Neglect
- Adjustment by non-authorized sources
- Improper environment
- Excessive or inadequate heating or air conditioning or electrical power failures, surges, or other irregularities
- Equipment, products, or material not manufactured by OFITE
- Firmware or hardware that have been modified or altered by a third party
- Consumable parts (bearings, accessories, etc.)

Returns and Repairs:

Items being returned must be carefully packaged to prevent damage in shipment and insured against possible damage or loss. OFITE will not be responsible for equipment damaged due to insufficient packaging.

Any non-defective items returned to OFITE within ninety (90) days of invoice are subject to a 15% restocking fee. Items returned must be received by OFITE in original condition for it to be accepted. Reagents and special order items will not be accepted for return or refund.

OFITE employs experienced personnel to service and repair equipment manufactured by us, as well as other companies. To help expedite the repair process, please include a repair form with all equipment sent to OFITE for repair. Be sure to include your name, company name, phone number, email address, detailed description of work to be done, purchase order number, and a shipping address for returning the equipment. All repairs performed as "repair as needed" are subject to the ninety (90) day limited warranty. All "Certified Repairs" are subject to the twelve (12) month limited warranty.

Returns and potential warranty repairs require a Return Material Authorization (RMA) number. An RMA form is available from your sales or service representative.

Please ship all equipment (with the RMA number for returns or warranty repairs) to the following address:

OFI Testing Equipment, Inc.
Attn: Repair Department
11302 Steeplecrest Dr.
Houston, TX 77065
USA

OFITE also offers competitive service contracts for repairing and/or maintaining your lab equipment, including equipment from other manufacturers. For more information about our technical support and repair services, please contact techservice@ofite.com.