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Laboratory Screening Test to Determine the Ability of Scale Inhibitors to Prevent the Precipitation of Barium Sulfate or Strontium Sulfate, or Both, from Solution (for Oil and Gas Production Systems)

ABSTRACT

This standard describes a test method to screen scale inhibitors for their ability to prevent precipitation of $BaSO_4$ or $SrSO_4$, or both, from oilfield brines. This standard test method is intended to provide the user with a relative and quantitative measure of the ability of scale inhibitors to prevent (1) the formation and (2) the precipitation of solid $BaSO_4$ or $SrSO_4$, or both, which are necessary and critical stages in scale deposition. This standard is maintained by Task Group 383.

KEYWORDS

Scale inhibitors, sulfate

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Foreword

Mineral scale may be defined as an adherent deposit of predominantly inorganic compounds. A common process leading to scale formation is the precipitation of sparingly soluble salts from oilfield brines. Some oilfield brines contain sufficient sulfate ions (SO_4^{2-}) in the presence of barium ions (Ba^{2+}) or strontium ions (Sr^{2+}), or both, that the potential for forming barium sulfate ($BaSO_4$) scale or strontium sulfate ($SrSO_4$) scale, or both, exists due to changes in physical or chemical conditions. Often the formation of scale results in reduced production and increased maintenance costs. In some locations, naturally occurring radioactive materials (NORM) have been found to incorporate themselves into the scale. This complication may result in significant health, safety, and liability concerns and increased scale disposal costs.

Removal of scale after it has formed is particularly difficult when $BaSO_4$ and $SrSO_4$ are involved. Therefore, oil and gas producers most often use treatment chemicals to inhibit precipitation of these scales and reduce their tendency to adhere to surfaces. The choice of the best scale inhibitor for a given application often follows a lengthy testing program. The program typically begins with the collection of potentially useful products and then evaluation of them through a screening process in the laboratory to determine whether specific products or classes of products perform better than others.

NACE Standard TM0374[1] addresses only the screening of $CaSO_4$ and $CaCO_3$ scale inhibitors. By contrast, this standard test method is intended to provide the user with a relative and quantitative measure of the ability of scale inhibitors to prevent (1) the formation and (2) the precipitation of solid $BaSO_4$ or $SrSO_4$, or both, which are necessary and critical stages in scale deposition. This standard is intended for use by skilled laboratory personnel who have previously performed similar tests. The laboratory screening procedure described in this standard may not allow for the simulation of all oilfield system variables. It must be regarded only as a starting point in the evaluation of scale inhibitors. The procedure standardizes the collection of screening test results to facilitate discussion of the results by interested parties. No attempt has been made to define the test brine composition, test temperature, or test duration. Users of this standard must agree on these and other critical parameters to facilitate comparison of test results.

This standard was originally prepared in 1997 by Work Group T-1D-36a, a subgroup of Task Group (TG) T-1D-36, "Scale Inhibitor Evaluation in Oil and Gas Production," a component of Unit Committee T-1D, "Corrosion Monitoring and Control of Corrosion Environments in Petroleum Operations." It was reaffirmed in 2002 by Specific Technology Group (STG) 31, "Oil and Gas Production—Corrosion and Scale Inhibition," and it was revised in 2010 and 2018 by TG 383, "Scale Inhibitor Evaluation in Oil and Gas Production." This standard is issued by NACE International under the auspices of STG 31.

In NACE standards, the terms ***shall, must, should,*** and ***may*** are used in accordance with the definitions of these terms in the NACE Publications Style Manual. The terms ***shall*** and ***must*** are used to state a requirement, and are considered mandatory. The term ***should*** is used to state something good and is recommended, but is not considered mandatory. The term ***may*** is used to state something considered optional.

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