

New ASTM Standard Test Method for Determination of the Reflectance of Vitrinite Dispersed in Sedimentary Rocks

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Vitrinite is the dominant organic constituent of coal and its mean reflectance can be reproducibly determined by different operators in different laboratories with different test equipment. Standard test methods to determine vitrinite reflectance of coal have been long published by the American Society for Testing and Materials (ASTM) and the International Organization for Standardization, among others, and these tests for coal have served as guides for measurement of reflectance of vitrinite dispersed in sedimentary rocks. However, numerous published examples indicate high inter-laboratory variability for dispersed vitrinite reflectance analysis which can be attributed to lack of a common method.

To address this shortcoming, a new ASTM standard test method to determine the reflectance of vitrinite dispersed in sedimentary rocks was developed by an international committee of technical experts from government agencies, academia, industry, and consultancies. This partnership between members of ASTM, the International Committee for Coal and Organic Petrology (ICCP), The Society for Organic Petrology, and the American Association of Petroleum Geologists was formed to address the need for standardization in vitrinite reflectance analysis of rocks other than coal, in particular, shale. With current oil and gas industry interest focused on unconventional shale gas plays, it is critically important that the most commonly used thermal maturity indicator, i.e., vitrinite reflectance, have a codified procedure for measurement.

The first step in development of the new test method was a survey of common practices used in laboratories that routinely measure the reflectance of dispersed vitrinite. The writing committee was identified from within the survey respondents, and the ASTM coal vitrinite reflectance standard (D2798) was used as the outline to frame the new standard. Significant deviations from the coal standard included: 1) specialized terminology to include recycled vitrinite, zooclasts, solid bitumens, and marine algae; 2) discussion of potential for vitrinite suppression and retardation in certain conditions; 3) inclusion of fluorescence observation and resulting changes to equipment description and procedure; and 4) addition of reporting requirements including type and quality of sample preparation, observation of fluorescence, and consideration of supporting data and information.

The new standard was successfully balloted at the ASTM D05.28 coal and coke petrography subcommittee level in November, 2010, and at the ASTM D05 coal and coke main committee level in March, 2011. It will appear in print form later this year in the 2011 Annual Book of ASTM Standards, v. 05.06, Gaseous Fuels; Coal and Coke. Anticipated users include government, academic, and service laboratories, and adoption as the prescribed method for the dispersed vitrinite reflectance accreditation program of the ICCP, which currently includes approximately forty laboratories worldwide. The test method will be most useful for those working in shale gas plays where vitrinite reflectance is considered the most robust thermal maturity parameter. Anticipated future improvements to the standard include the creation of quantified reproducibility and repeatability values through laboratory round-robin exercises, and the development of a supplemental online image atlas of dispersed organic matter in sedimentary rocks to aid in the identification of primary vitrinite.