

## **Color measurement of methylene blue dye/clay mixtures and its application using economical methods**

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Identifying the clay mineral components of clay materials by staining tests is rapid and simple, but their applicability is restricted because of the mutual interference of the common components of clay materials and difficulties in color determination. The change of color with concentration of the dye is related to the use of colorants as a field test for identifying clay minerals and has been improved over the years to assure the accuracy of the tests (Faust G. T., 1940). The problem of measurement and standardization of color may be solved by combination of colors observed in staining tests with prepared charts of color chips available in the Munsell Book of Color, published by Munsell Color Co. Under a particular set of illumination conditions, a human eye can achieve an approximate match between the color of the dyed clay sample and that of a standard color chip, even though they do have different spectral reflectance characteristics.

Experiments were carried out with diffuse reflectance spectroscopy on selected clay samples (three montmorillonite, three kaolinite and one mix-layer clay samples) saturated with different concentration of methylene blue dye solution. Dominant wavelength and purity of the color was obtained on oriented dry samples and calculated by use of the I. C. I. (x, y) – diagram in the region of 400-700 nm (reflectance spectra) without MB and after saturation with different concentrations of MB solutions. Samples were carefully photographed in the natural light environment and processed with user friendly and easily accessible applications (Adobe color CC and ColorHexa encyclopedia) available for android phones or tablets. Obtained colors were compared with Munsell standard color chips, RGB and Hexa color standards.

Changes in the color of clay samples in their interaction with different concentration of the applied dye together with application of economical methods can still be used as a rapid fieldwork test. Different types of clay minerals can be distinguished by application of at least three concentrations of the methylene blue dye on the same sample and observing the color change in comparison with standardized color chips that can be easily obtained and free of charge. If the color tests are properly used in conjunction with other more complex analytical procedures, they can be helpful addition in identification of different clay minerals, especially montmorillonite and kaolinite minerals.

- Faust G. T., 1940, Staining of clay minerals as a rapid means of identification in natural and beneficiated products, U. S. Bur. Mines, Investigation Report. N0.3522
- Munsell Color, Munsell Book of Color, 1942. Macbeth Division of Kollmorgen Corporation, Maryland, U.S.A.
- <https://color.adobe.com/create/color-wheel/>
- <http://www.colorhexa.com/>