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Conclusion

Since the x-ray diffraction patterns, chemical analyses, and refractive indices show such close relationship it seems hardly worth while to retain the two names smectite and montmorillonite for what appears to be the same mineral. In view of the large amount of modern literature on montmorillonite it seems in the best interests of science to continue the name montmorillonite, and to drop that of smectite.

Smectite has been mentioned frequently in descriptions of fuller's earth. It would naturally follow therefore that the name montmorillonite should now replace that of smectite in referring to the clay mineral constituent of fuller's earth. It should also be emphasized that bentonite is a rock while fuller's earth is a clay having a definite commercial application. It is possible for a clay which is a bentonite by origin to have adsorptive properties which make it a fuller's earth.

NOTES AND NEWS

PIPERINE AS AN IMMERSION MEDIUM IN SEDIMENTARY PETROGRAPHY

James H. C. Martens, *West Virginia University.*

Piperine was used at least thirty years ago as an immersion medium for microscopic work, and is mentioned in several works on optical mineralogy and petrography as a suitable material for refractive index determination. Although it is probably known to most of those doing petrographic work, it has certain advantages in the examination of detrital minerals which appear to be worthy of special notice.

Directions for use of piperine together with reasons for preferring it to Canada balsam as an immersion medium for microscopic work on diatoms have been given by Chapman Jones.[1] Piperine is a definite chemical compound and is obtained in small crystals. Only the purified grade[2] is suitable for use as an immersion or mounting medium. In mounting grains in piperine it has only to be melted, not cooked, so slides may be prepared very rapidly. However, if the slides are prepared

[1] Jones, Chapman, Piperine as a mounting medium; *Watson's Microscope Record,* May 1925, pp. 11–12.

[2] Obtained from Eastman Kodak Company Rochester.

by merely heating to the melting temperature, the piperine begins to crystallize within a few days and before long this may render the slide useless. If the slides are to be kept and used repeatedly the tendency to crystallize is overcome by heating the slides in an oven at a temperature of 180°C. for one hour. This causes some darkening around the edges of the slide. If any excess of piperine extending outside the coverglass is to be removed with alcohol or other solvent this should be done before the final heating since the presence of the solvent will start crystallization. If any cloudy areas appear in slides which have been kept for a long time the slides are made clear again by heating until the piperine melts.

The refractive index of piperine (1.68) makes it especially useful for mounting heavy mineral separates from sediments. *All* of the common heavy detrital minerals have refractive indices distinctly higher than that of Canada balsam, and many of them are so much higher that it is difficult to estimate the refractive index accurately from the relief. Several of the common important heavy detrital minerals, including tourmaline, hornblende, micas, sillimanite, andalusite and collophane have refractive indices below 1.68. So does barite which occurs abundantly in the heavy portions of many well samples, and is probably authigenic in most instances.

The strong dispersion of piperine results in characteristic phenomena around the borders of mineral grains which usually make it possible to estimate the refractive index without actually observing the direction of movement of the Becke line. The colored border effects are best observed with the condenser lens out. When in focus the borders of grains with lower refractive index than the piperine appear yellow or orange. This was especially noticed on quartz, muscovite, barite, hornblende, sillimanite, and on tourmaline in the position of least absorption. If the mineral has refractive index very close to that of piperine the border appears green when the grain is in focus This was noticed on sillimanite for vibrations lengthwise of the crystal and on hypersthene.

Minerals with refractive index a moderate amount above that of piperine, say between approximate limits 1.70 and 1.76, have a blue border when the grains are in focus. Upon raising the tube slightly, a yellow line, inside of a blue one may be observed moving toward the center of the grain. This is the appearance of grains of garnet, epidote, cyanite, staurolite, augite, and chloritoid. Of course the colored borders are seen more plainly on some minerals than on others, depending upon the color of the mineral itself. Small irregular grains of light colored garnet or epidote may at first sight appear to be really blue because of the blue light due to dispersion around the borders and irregularities of the surface of the grain.

Variations in relief, corresponding to differences in refractive index, are similar to those with other immersion media. The minerals of very high refractive index, such as zircon, titanite, anatase and rutile look about the same in piperine as in Canada balsam. They are easily distinguished from minerals having a refractive index between 1.70 and 1.80 by the stronger relief and by the borders appearing dark rather than colored. Xenotime has both its refractive indices ($\epsilon=1.816$, $\omega=1.721$) above that of piperine, but when mounted in that substance it is easily distinguished from zircon, which has similar crystallization and like optical sign, by showing low relief and exhibiting colored borders for light vibrating parallel to the base. With a quarter turn of the stage the xenotime crystal shows much stronger relief, while the relief of the zircon is high and not appreciably different in the two positions. Using piperine as an immersion medium xenotime was found in the heavy separates from several sediments in which it had been overlooked when using Canada balsam to mount the heavy minerals.