The Tyndall Effect of Uniform Minerogenic Suspensions

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(Manuscript received May 15, 1953)

The distribution of matter suspended in ocean water was studied during the Swedish Deep-Sea Expedition be measuring the Tyndall effect in water samples (JERLOV, 1953). The scattering, s km^{-1}, caused by particles in suspension was computed.

In order to make it possible to determine, approximately, the weight of suspended matter per liter water the present writers have measured the Tyndall effect of uniform suspensions with known concentrations. A series of suspensions were prepared containing minerogenic particles (quartz and felspars) derived from a varved clay collected in the Southern Baltic, each suspension being made uniform as regards the size of the particles. This was achieved by allowing the suspensions to settle a great number of times, using narrow time limits. The work was carried out in a dark room with a constant temperature, cleaned from dust by thorough washing and protracted running of a vacuum cleaner. The size of the particles in the suspensions finally obtained was checked by microscopic measurement. The weight of suspended matter per liter water was determined by evaporating to dryness about 10 ml of each suspension. The suspensions were successively diluted by distilled water, with an addition of 0.02 % ammonia, showing a Tyndall effect not exceeding the one observed in very pure deep water. The Tyndall effect was determined for blue light at the various

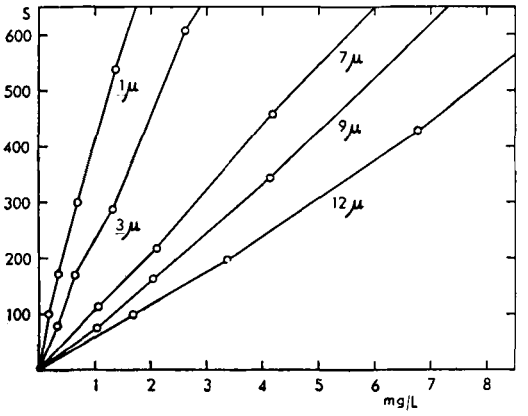

Fig. 1. The Tyndall effect of suspensions of quartz and felspar.

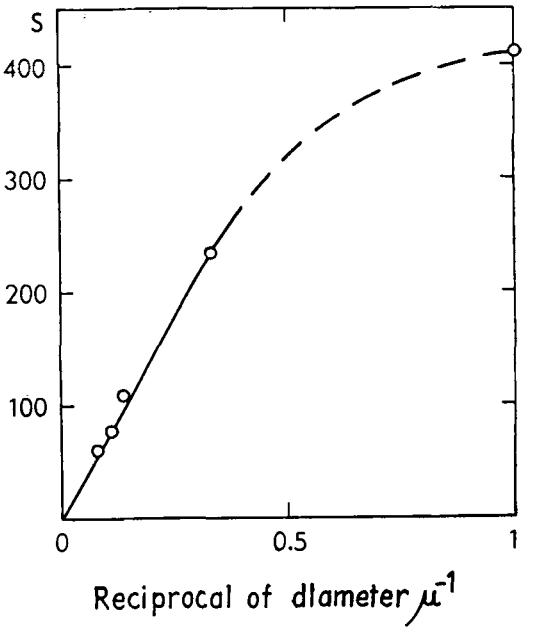

Fig. 2. Relationship between Tyndall effect and particle size at a concentration of 1 mg. per liter.

concentrations arrived at, the suspended matter was allowed to settle, and the very small Tyndall effect of the remaining impurities in the water was determined and applied as a correction. The observations are plotted in fig. 1, and interpolated values are given in Table 1. As shown by fig. 2, the linear relationship between the Tyndall effect and the reciprocal diameter of the particles is valid only if the diameter exceeds about 2 micron (DALLAVALLE, 1948).

Table 1. Scattering as determined by the Tyndall effect, and weight of suspended matter per liter. The size of the particles in suspension varies within about 10 % of the figures in the table.

s km^{-1}	Suspended matter in mg/L				
	1 μ	3 μ	7 μ	9 μ	12 μ
100	0.17	0.40	0.91	1.30	1.68
200	0.41	0.82	1.88	2.47	3.37
300	0.68	1.35	2.77	3.62	4.80
400	0.97	1.76	3.64	4.71	6.31
600	1.56	2.58	5.51	6.79	8.74

REFERENCES

DALLAVALLE, J. M., 1948: *Micromeritics*. New York and London.

JERLOV, N. G., 1953: Particle distribution in the ocean. *Reports of the Swedish Deep Sea Expedition*, **3**, 73; Appendix, Table 1.