A New Type of Spectrometer for Determination of the Refractivity of Liquids and Gases

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Fig. 1 shows the basic design of a spectrometer (horizontal plane). Light from the source *A* passes the vertical slit *B* and the lens *C* and passes the vertical prism *D* as a beam which is parallel in the horizontal plane. After passing the prism *D* the light is focussed by the lens *E* at *F* and finally refocussed by the lenses *G* and *H* on the photographic plate *I*.

Fig. 1. Diagram of spectrometer in the horizontal plane. The lenses *E* and *G* are cylindrical with vertical axis. In the vertical plane the image of the prism *D* through the lens *H* falls on *I* as indicated by the dotted line.

The horizontal position of the vertical image of the slit on the photographic plate will depend on the refractivity of the prism *D*. The vertical prism *D* may be hollow and filled with the sample to be examined.

The lenses *E* and *G* may be cylindrical with vertical axis in which case the system will be strongly astigmatic. If the image of the prism *D* by the lens *H* in the vertical plane then falls on the photographic plate every level of the vertical prism will correspond to a definite level on the photographic plate.

If the prism contains an heterogeneous liquid — for example pure water floating on a denser sugar-water solution — the place in which the light reaches the photographic plate at any horizontal level will

depend on the refractivity of the liquid at the corresponding level inside the prism, and the picture obtained on the plate will be of the kind shown in Fig. 2.

Fig. 2. Photograph taken at *I* (Fig. 1) with layers of water and sugar solution inside the hollow prism *D* (Fig. 1). The effect of the diffusion of sugar into water is made visible by the sigmoid curve. The vertical lines are for orientation of the curve.

In the case corresponding to Fig. 2 a 60° prism was used, having sides of 5 mm and a height of 20 mm. Fig. 2 is the very first picture obtained with the arrangement just described. There is little doubt that better results will be obtained later.

We wish to stress that the optical system on the light source side of the slit also has to be astigmatic. In the horizontal plane the light from the lamp *A* should be collected at the slit *B*, in the vertical plane at the prism *D*.

Cand. mag. Bjørn B. Hansen has been most active by assembling the existing apparatus and has also done the pre-calculation of the important lenses. Together we will publish more detailed descriptions of the apparatus.

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