COMUNICACION BREVE

The use of standard desviations in szaboís diffraction intensity measurements optimization method

LUIS FUENTES COBAS

Grupo de Física de Metales, Escuela de Física,
Universidad de La Habana

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ABSTRACT. Method 1) of "second optimization" is elaborated making use of standard deviations instead of maximum estimated errors, and the pertinently modified formulas are given.

RESUMEN. Se ha elaborado el método de "segunda optimización" de 1) haciendo uso de desviaciones standard en lugar de errores máximos estimados. Se dan las fórmulas correspondientes modificadas.

Szabó[1] applies for the caracterization of errors of measurements the standard deviations throughout his calculations of the so-called first optimization. But for his "second optimization" he makes use of the so-called maximum estimated errors.

We consider adequate to elaborate his method of second optimization using also standard deviations, making it more consistent with his first optimization.

If we now take as error dc the standard deviation, we may calculate it according to the well known formulas of the theory of errors, as may be taken e.g. from.[2] In this manner we obtain, instead of eqs. (3.3), (3.4), (3.6), (3.7), (3.9) and (3.10) of Szabó the following ones:

$$\frac{dc}{c} = \sqrt{\left(\frac{dI_1}{I_1}\right)^2 + \left(\frac{dI_2}{I_2}\right)^2} \qquad (3.3')$$

$$p_c = \sqrt{p_1^2 + p_2^2} \qquad (3.4')$$

$$\frac{dc}{c} = (1\text{-}c)\sqrt{\left(\frac{dI_1}{I_1}\right)^2 + \left(\frac{dI_2}{I_2}\right)^2} \qquad (3.6')$$

$$p_e = (1\text{-}c)\sqrt{p_1^2 + p_2^2} \qquad (3.7')$$

$$\frac{dc}{c} = \tfrac{1}{2}\sqrt{\left(\frac{dI_1}{I_1}\right)^2 + \left(\frac{dI_2}{I_2}\right)^2} \qquad (3.9')$$

$$p_e = \tfrac{1}{2}\sqrt{p_1^2 + p_2^2} \qquad (3.10')$$

All the other quantities here have the same meaning as in the paper of Szabó.

In consequence of these changes the condition for the optimum measuring time, in our three cases, will be:

$$p_1/p_2 = \sqrt[4]{f_1/f_2} \qquad (3.16')$$

instead of the cubic root expression (3.16) of Szabó.

The use of our formulas doesn't mean any modification of the optimization process, but it does make it more consistent in view of the uniform use of standard deviations.

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2) *Beers Y.* Introduction to the theory of error. Addison-Wesley, 1957.