Determining Surface Area and Thickness of a Sample

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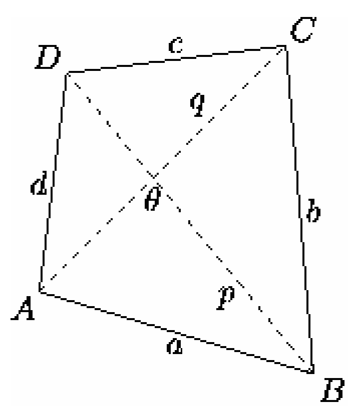
Surface Area:

In taking measurements, your samples will not be perfectly square. Since we cannot assume any side to be parallel with such small samples, we must use the general quadrilateral formula to find the area.

Using the General Equation for a Quadrilateral:

$$\text{Area} = \frac{1}{2} pq \sin\theta = \frac{1}{4}\sqrt{4p^2q^2 - (b^2 + d^2 - a^2 - c^2)^2}$$

Where a, b, c, and d are all different side lengths and p and q are each the diagonals BD and AC on the quadrilateral respectively (The measure of these variables can all be taken by micrometer). The angle θ is the angle at the intersect of p and q. See Diagram below.



It is also possible to derive a method through triangles and the law of sine however this proves to be much quicker.

Thickness of a Sample:

In the need to find the thickness of your given sample, utilize the newly found surface area in the calculations. Also consider the Magnetization Saturation denoted as M_s:

$$M_s = \frac{m}{V}$$

Where m is the magnetic moment of the sample and V is the volume of the sample (both of which measured in e.m.u/cm^3). The magnetic moment can be determined by saturation on the VSM. The M_s is a constant dependent upon the material being measured (in the case of iron, the M_s is 1751 e.m.u/cm^3). The Volume is the product of the length, width, and thickness, which we will denote as thickness t:

$$M_s = \frac{m}{A \cdot t}$$

Where A is the Surface Area of the Sample, we solve for thickness t:

$$t = \frac{m}{A \cdot M_s}$$

The Area again can be determined from the surface area of a general quadrilateral equation (see above).

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