In order to obtain a unit of pressure in terms of the height of a column in a liquid manometer, a unit which is also related decimally to absolute units of pressure, Dr. Florescu proposes to elevate the pressure due to a 0·75-mm. column of liquid of density 13·5951 gm./cm.^{3}, g being 980·7455 cm./sec.^{2}, to the status of a new unit, and call it the 'vac'. But as Dr. Florescu admitted originally, this pressure is effectively 10^3 dynes/cm.^{2}, called internationally the millibar, and for the practical purposes of vacuum technology the pressure due to ¾ mm. of a standard mercury column (density 13·5951 gm./cm.^{3}, standard gravity 980·665 cm./sec.^{2}) is one millibar (more closely it is 0·999 92 mb.). Quite apart, therefore, from Dr. Volet's point, with which I entirely agree, I see no justification for introducing a new unit, the 'vac', the definition of which involves a new, arbitrary reference gravity, when the scale it would provide would in vacuum practice be indistinguishable from a scale of millibars.

This comment is published with the permission of the Director of the National Physical Laboratory.

P. H. Bigg

Standards Division,
National Physical Laboratory,
Teddington, Middlesex.

METALLURGY

Anomalous Magnetostriction of the 'Grain-orientated' Silicon–Iron Sheet

This communication is concerned with the anomalous phenomenon occasionally found in examining the magnetostriction of the 'grain-orientated' silicon–iron sheets, and it was believed to be a prime cause which gives rise to a transformer noise. The method of measurement is the static one which has been adopted by us for a long time[1], and by this method the mean value of magnetostriction can be obtained. The experiments were carefully made with respect to a thin plate-like specimen.

The specimen contains 4·35 per cent silicon, and is used by a trade name of 'T-90' in Japan. The specimen is a rectangular plate, 0·37 mm. thick, 6 mm. wide and 10 cm. long, and the direction of length corresponds to that of measurement and rolling. Fig. 1 shows a result for the specimen annealed at 600° C. for 1 hr. after cutting down the specimen from a large sheet.

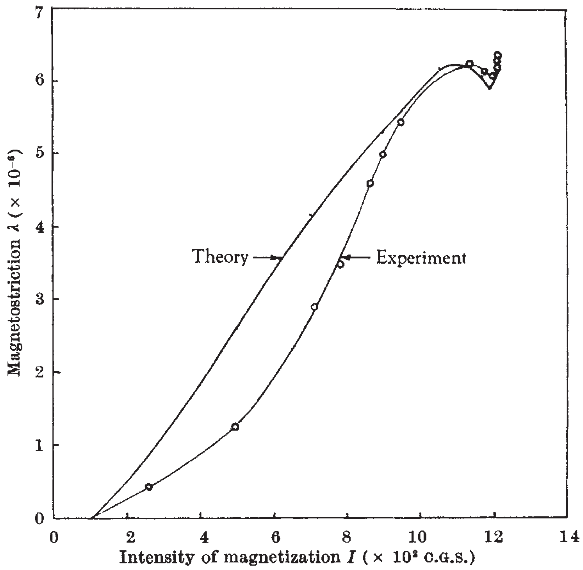

Fig. 1. Anomalous magnetostriction curves obtained experimentally and theoretically in the 'grain-orientated' silicon–iron sheet

As shown in Fig. 1, the magnetostriction does not appear up to 100 C.G.S. and then increases gradually, showing a minimum just before saturation with the increasing intensity of magnetization, and lastly, increases abruptly to a saturation value. It will be due to the 180° wall displacements that the magnetostriction does not appear in the first step. Adequate interpretation of this phenomenon may be very difficult, but we reasoned as follows.

In general, in iron-base alloys, including the 'grain-oriented' iron–silicon sheets, the magnetostriction is positive in an easy direction, and is negative in a hard direction. Therefore, the magnetostriction of polycrystal specimen is the sum of both values mentioned above, so that it is ordinarily encountered that the magnetostriction curve is either parabolic or exponential.

Now, in the range of continuous rotation of domain in the magnetization process, the mechanism of rotation may be greatly affected not only by the intrinsic crystal magnetic anisotropy but also by the additive restraint force or uniaxial anisotropy induced by rolling.

Some amount of the restraint force mentioned above may coincide with a special direction near an easy one. If so, in this direction, the domain rotations may be restrained, hence the magnetostriction does not appear below a critical magnetic field the energy of which surpasses the restraint force.

In such a way, the anomalous curve shown in Fig. 1 may be explained. Next, the simple theoretical expression may be given according to Heisenberg's theory of magnetostriction in the unsaturated magnetization region[2].

Using the above results and the magnetostriction constants obtained by Shturkin[3], and assuming that the fractions of orientation <100>, <110> and <111> are 0·3, 0·6 and 0·1 respectively, the theoretical magnetostriction can be calculated as shown in Fig. 1. A good agreement exists between the theoretical and the experimental results.

Yuki Shirakawa
Ken'ichi Numakura

Research Institute for Iron, Steel and Other Metals,
Tohoku University, Sendai.

[1] Honda, K., Masumoto, H., Shirakawa, Y., and Kobayashi, T., *Sci. Rep. Res. Inst. Iron, Steel and Other Metals* (Japan), A, 1, 341 (1949).
[2] Heisenberg, W., *Z. Physik*, **69**, 287 (1931).
[3] Shturkin, D. A., *Bull. Acad. Sci., U.R.S.S.*, **9**, 661 (1947).

Formation of Silicon Nitride Whiskers on a Ferro-Silicon Alloy at Room Temperature

After approximately ten years of operation, a calcium carbide furnace at Odda Smelteverk A/S, Norway, was temporarily stopped. At the bottom of the furnace a phase containing a ferro-silicon alloy was found. A sample taken from this bottom phase was kept in contact with air at room temperature. After a few weeks, formation of greyish-brown whiskers on the surface of the sample was observed.