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Köster W. Die Temperaturabhängigkeit des Elastizitätsmoduls reiner Metalle. (The temperature dependence of the elasticity module of pure metals.) *Z. Metallk.* **39**:1-9, 1948.
[Kaiser-Wilhelm-Institut für Metallforschung, Stuttgart, Germany]

The nondestructive determination of the elasticity module using measuring equipment developed by Förster[1] provided a broader view of the elastic behavior of metals and alloys, including the measurement of the temperature dependence of the module using a single trial. [The *SCI*® indicates that this paper has been cited in over 250 publications since 1955.]

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"The perfection of the measuring technique is very important for the advancement of science. With this in mind, I welcomed the fact that, shortly after the establishment of the Kaiser-Wilhelm-Institut (today's Max-Planck-Institut für Metallforschung in Stuttgart) in 1934, Friedrich Förster developed an instrument for the nondestructive measurement of the elasticity module. It was based on the determination of the natural frequency of a transversely oscillating rod. Using this instrument, I studied the dependence of the module on the structure, as well as the wide-range thermal and mechanical treatment, of metals and alloys. The experimental evidence on this subject was very scanty at that time. Included within this framework was the measurement of the temperature dependence of high-purity metals between 90 and 1,273 K. Since this work has been repeatedly cited up to the present, it is obviously an indicator of the value of the collective investigations of physical data. It is essential for scientific considerations and technical calculations to possess this data and be able to refer back to it at any time. I feel that the citation by colleagues indicates that the measured values are considered reliable. I am grateful to Förster for developing the measuring equipment and I want to thank Emmi Amrhein for the precise execution of the measurements.

"The measuring instrument, which is widely recognized by the name Elastomat, permits the measurement of the frequency of the oscillations and also their damping. This allows the quantitative measurement of property, which was hardly considered in the field of metal research. We have also determined the behavior of the damping as a function of the factors mentioned here in a preliminary survey. During the years, research on the anelasticity of metals and alloys has expanded into an important field of research. It was recognized that many phenomena could be more thoroughly studied using a low-Hertz frequency rather than the 600 to 1,200 Hertz of the Förster apparatus. For this range, a new instrument was introduced worldwide, the torsion pendulum, by T.S. Kê.[2]

"In addition to other phenomena, I studied the relaxation process introduced by cold working of iron together with L. Bangert and R. Hahn using this measuring equipment.[3] We obtained strong experimental evidence that the process is caused by an interaction of interstitially dissolved carbon and nitrogen atoms with dislocations generated during plastic deformation. In the nomenclature of relaxation phenomena given by A.S. Nowick and B.S. Berry, this process is named Snoek-Köster relaxation.[4] The study of the strain aging of steel is based on a longtime interest in this question dating back to my work in the steel industry during the 1920s. With the aid of damping measurements, an experiment could be performed to study the characterization of the quality features of low-carbon steel.

"Through the application of new measuring techniques, which permit the analysis of the sound of metallic samples, I have been able to expand the data on the elastic properties of metals and alloys and to better understand the processes underlying the specific behavior of certain materials."

1. **Förster F.** Ein neues Messverfahren zur Bestimmung des Elastizitätsmoduls und der Dämpfung. *Z. Metallk.* **29**:109-15, 1937. (Cited 100 times since 1955.)
2. **Kê T S.** Experimental evidence of the viscous behavior of grain boundaries in metals. *Phys. Rev.* **71**:533-46, 1947. (Cited 255 times since 1955.)
3. **Köster W, Bangert L & Hahn R.** Das Dämpfungsverhalten von gerecktem technischem Eisen. *Arch. Eisenhüttenw.* **25**:569-78, 1954. (Cited 70 times since 1955.)
4. **Nowick A S & Berry B S.** *Anelastic relaxation in crystalline solids.* New York: Academic Press, 1972. 677 p.

