

The Physics Experiments of Robert Wichard Pohl (1884–1976)

For decades, Robert Wichard Pohl taught his famous lectures of introductory physics in the old lecture hall of the Physics Institute at Goettingen University. These lectures became the foundation for three volumes entitled „Introduction into Physics“. Now, using Professor Pohl’s original instruments in the same lecture hall in which he taught, this set of videos captures his extraordinary ingenuity and once more brings to life Pohl’s great experimental skills.



Plastic deformation, rupture strength

Video title: Plastic deformation, rupture strength

Signature: C 14834

Series title: The Physics Experiments of Robert Wichard Pohl (1884-1976)

Abstract: The measurements performed in exp. 12 on a copper wire, which had been limited to elastic deformations at small stresses, will be extended here to larger stresses. When the yield stress is exceeded, plastic, i.e. irreversible deformation is observed. A further increase of the stress, beyond the rupture strength, leads to rupture.

Source: Pohls Einführung in die Physik - Mechanik, Akustik und Wärmelehre. Lüders, Klaus; Pohl, Robert Otto (Hrsg.) 19. Aufl., 2005, Springer Berlin Heidelberg New York; p. 116, 117

Key words: Mechanics, metal physics, tension, flow stress, plastic deformation, rupture strength

Goal of the experiment:

The measurements performed in exp. 12 on a copper wire, which had been limited to elastic deformations at small stresses, will be extended here to larger stresses. When the yield stress is exceeded, plastic, i.e. irreversible deformation is observed. A further increase of the stress, beyond the rupture strength, leads to rupture.

Experimental setup:

A 40 cm long piece of the same wire as used in exp. C 14833 is suspended on a lab stand, and carries a tray on which weights can be deposited. A pillow under the tray will dampen the fall when the wire ruptures. The visibility of the setup is improved through the use of shadow projection, a technique characteristic for Pohl’s presentation in both his lectures and books.

Experiment:

The loading of the tray occurs in three steps : First, 2 kg cause a clearly visible elongation (which is essentially irreversible, although this is not shown here). The addition of 1 kg results in a slow length change of several centimeters, the wire „flows“, until „work hardening“ leads to a constant elongation. The addition of only 200 g finally leads to rupture, as the rupture strength is exceeded.

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