Determining the Young's modulus of a metal wire

Transcript

The Young modulus is a constant which allows the extension of materials of different sizes and shapes to be calculated.

In this experiment, the Young modulus of a metal wire will be measured.

A bench pulley is fixed to a retort stand or attached to the edge of a desk.

The copper wire is passed between two wooden blocks.

The blocks are clamped in position 1 m from the pulley. Care is taken to ensure the clamp is fully tightened.

The other end of the wire is passed over the pulley and attached to a mass hanger.

A metre rule will be used to measure the extension of the wire.

A pointer is made from tape or paper and positioned a fixed distance, L, from the clamp.

A mass is added to the hanger.

The extension of the wire is measured.

The diameter of the wire is measured at three points along its length using a micrometer. The average diameter is calculated.

Additional mass is added to the hanger.

The extension is measured.

Each time, the diameter of the wire is measured at three points along its length.

The stress applied to the wire is equal to the force divided by the cross-sectional area. This can be calculated using the data collected from an experiment like the one shown here.

To calculate the Young modulus a graph is plotted of stress against strain.

A line of best fit is drawn.

The Young modulus is found by dividing stress by strain.

The gradient of the linear section of the line of best fit is therefore equal to the Young modulus.

This experiment has demonstrated how to calculate stress and strain when the tensile force on a wire is varied. By plotting a graph of stress against strain the Young modulus of the wire can be determined.