

A replica of 'Le Grand K'

PLATINUM: A SCIENTIFIC CONTRIBUTION ON A MASS-IVE SCALE

Platinum's unique physical properties have long been recognised by the scientific community. Since 1799, it has been the global standard by which a kilogram is defined

A kilogram is the base unit of mass established by the International System of Units (SI), and its origins date back to the end of the 18th century, when a cylinder of platinum was first used to represent the value of one kilogram of mass.

Prior to its adoption, everyone from scientists to shopkeepers was frustrated by the absence of a consistent, standardised means of accurately measuring mass, and the arrival of the kilogram heralded the beginning of what we know as the metric system.

Platinum's services to metrology

Today's international prototype of the kilogram (IPK), the benchmark for what a kilogram is, is a 90 per cent platinum-iridium alloy cylinder, 39 mm in height and diameter, known affectionately as 'Le Grand K'.

Introduced in 1889, Le Grand K is kept at the International Bureau of Weights and Measures (IBWM) in Sèvres, France.

Stored in a vault, vacuum-sealed under three bell jars and secured by three keys, it is only removed every 40 years to prevent contamination, which could lessen its accuracy.

Adieu to Le Grand K

The kilogram is the only remaining SI unit of measurement that is still defined by a physical object, and, although the current IPK has served its purpose well for almost 130 years, there is a need for ever-more accurate measurements in science and industry.

As such, the search has been underway for a redefinition of the kilogram that offers the

- METROLOGY is the science of measurement.
- MASS is a measure of the amount of matter in an object. Mass stays constant, as opposed to weight, which depends on gravity.
- A KILOGRAM is the base unit of mass as defined by the SI.
- The SI is the International System of Units used by the scientific community.
- SIs are set by the INTERNATIONAL BUREAU OF WEIGHTS AND MEASURES, an inter-governmental organisation through which member states act together.
- The PLANCK CONSTANT is an important quantity in quantum physics that links the amount of energy in a photon (simple particle) with the frequency of its electromagnetic wave.

guaranteed long-term stability that it is not possible to achieve with an artefact, especially as, on its last inspection, Le Grand K was found to have lost mass. Infinitesimal as this was, equivalent to a grain of sand, it served to demonstrate the limitations of using a physical object.

This is why Le Grand K is soon to be retired from service, subject to a vote by the IBWM member states next month. The kilogram will then be redefined in terms of quantum mechanics using the 'Planck' constant, a measure derived from the frequency of a subatomic particle.

Defining the kilogram in terms of a fundamental physical constant will provide a much more practical, as well as reliable, solution for scientists. Once adopted, the new standard will mean that the IPK can be replicated anywhere in the world, at any

time, and cannot be compromised by pollutants.

Platinum's unique properties

Platinum was chosen as the main component of the original IPK due to its high density and 'relative inertness', or stability, which meant that it was less likely to become contaminated or degrade over time.

These are the same unique properties, as well as its catalytic abilities and malleability, which make platinum a highly-prized material for a multitude of applications throughout industry today, from medicine to manufacturing.

In fact, industrial demand for platinum is forecast to rise by 5 per cent this year and, in addition, as one of the rarest metals in the world, it is increasingly being viewed as an investment asset.

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