Measure Atom Layers for Better "Talkies"

Physics

Layers of metallic rubidium, only one atom deep, so thin that several million would be required to equal the thickness of the paper this is printed on, have been measured at the Bell Telephone Laboratories. Thin films of rubidium, a metal similar to the sodium of common salt, are important because of their use in photoelectric cells.

As the magic lamp of modern physics, the photoelectric cell, transmuter of light variations into sound, is the very heart of the revolutions in industry that have been plotted in the physics laboratories. Talking motion pictures, radiovision, television, telephoned photographs would all be impossible without the photoelectric cell.

In the course of researches on how to make the photoelectric cell most efficient, A. L. Johnsrud measured the thin films. When the film of metal inside the glass cell was very thin it operated better than when thicker. Rubidium can be made into thin films more easily than its relative metals, because at rather low temperatures and without loss of time it can be made to evaporate and the vapor deposited, in a vacuum, to form such a film.

A large photoelectric cell was made and so arranged that rubidium could gradually be deposited on the glass, or else, after a thick deposit had been made, it could gradually be removed. While the film was thus getting thicker or thinner, the photoelectric response, the current given off when light fell on it, could be measured. Since the maximum response was obtained at the same point, whether the film was growing thicker or thinner, it was necessary exactly to record the film's depth.

Ordinary measuring methods proved inadequate and polarized light was used. Polarized light differs from ordinary light because, by passage through a special kind of prism, it is made to vibrate in a single direction. Ordinary light waves vibrate up and down, right and left, and in every conceivable direction, but that of polarized light is confined to a single plane.

When polarized light passes through any film, such as the one of rubidium, the direction in which it vibrates is twisted. The thicker the film, the more it is twisted. By means of another prism similar to that which polarizes the light the extent of the twisting, and also the thickness of the film, is measured. The most current was obtained when the film was but one atom thick.

Science News-Letter, November 17, 1928

Million Volt X-rays

Physics

X-rays, driven by a potential of a million volts, one of the latest of recent achievements of science, are produced by the rather complicated apparatus depicted this week on the cover. In the Science News-Letter for June 2, on page 349, this work was described.

The famous Norman Bridge Laboratory of the California Institute of Technology is the scene of these labors. Dr. C. C. Lauritsen, shown at the switchboard, has performed this work, in collaboration with his colleague, Dr. R. D. Bennett.

The tube consists of the glass cylinders in the center. A vacuum of about a billionth of an atmosphere is obtained inside. A water-cooled anode, raised to a potential of a million volts by the laboratory's high-tension transformers, pulls electrons bodily out of the nearby cathode. With this great force, the electrons attain a speed nearly as great as that of light. Striking the anode at this terrific speed, X-rays are formed, which closely resemble the gamma rays of radium. The rays make themselves evident more than a hundred feet away, on the other side of the steel laboratory door when the "tube" is operated.

As the cosmic rays studied by Dr. R. A. Millikan, the director of the laboratory, are really ultra-short X-rays, this forecasts their artificial production.

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