Chemical Links Told By Dark Bands

Chemistry

The chemical bonds between particular kinds of atoms are tuned precisely with certain wave-lengths of light, according to recent discoveries of Dr. Joseph W. Ellis, physicist in the University of California at Los Angeles. Instead of cooperating with the light radiation, however, these chemical attachments nullify or absorb the special light waves to which they are attuned. Dr. Ellis thus identifies the bonds by noting the kind of light which does not get through the substance he is investigating.

For decades chemists have been able to tell what elements are present in a substance, and in most cases how many atoms of each. The pattern by which the atoms are tied together in compounds, however, is known or guessed only on circumstantial evidence. Nevertheless the pattern is all-important. Dr. Ellis' experiments show which atoms are directly bonded together.

Chemists would gladly accomplish all this by magnification and direct photography of the molecular structure. Unfortunately this is impossible with atoms only one two-hundred-millionth of an inch in diameter, and light waves five thousand times as wide.

By the new methods infra-red, or low frequency, rays are passed through simple chemical compounds like aniline, alcohol, etc., whose structure is already known and undisputed. Accurate measurement is made at the odd places in the spectrum where a stoppage of light is caused by particular chemical bonds. Dr. Ellis is able to specify with high numerical accuracy just what wave-length, or color of light will be absorbed if a substance under examination contains, for example, a nitrogen atom attached to a hydrogen atom. Nitrogen and hydrogen atoms scattered about in other relations and tied to other atoms give no such response. Similar data have been obtained for the carbon-hydrogen and sulfur-hydrogen bonds. Many additions to the list are expected with further research.

By combining a spectograph and camera with electrical accessories, the physicist simply tests his substance down the gamut of the spectrum from blue to infra-red. Each chemical bond records its presence by a dent in the photographic line record. Just as a piano wire may respond to sounds in more than one octave, so the chemical bonds give over-tone records which confirm the proof desired.

Even greater value may lie in the possibility of calculating the strength of a chemical bond. Dr. Ellis is enabled through mathematical physics to show how firmly a substance is bonded on a basis of the wave-length chosen. From such a computation it may be possible to predict in some degree the possibility of some desirable chemical reaction taking place.

Science News-Letter, June 16, 1928

An Airport at Night

Aviation

In a few years such scenes as that on our cover this week will doubtless be familiar to travelers. Already in Europe there are many passenger planes leaving from the great airports, like Le Bourget and Tempelhof, at night. And in America the air mail has pioneered in nocturnal flying for extended periods of time.

The cover illustration is from a painting by Walter L. Green, made for the General Electric Company, through whose courtesy it is reproduced. It shows an airport illuminated according to the most modern practices. The revolving beacon light, extending out to the horizon, the flood-lighting of the field itself, the boundary marking lights, and the wing lights on a plane about to land —all these are shown by Mr. Green.

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The Emperor Nero is said to have destroyed a number of his enemies by feeding them poisonous mushrooms at a banquet.

A lake in Glacier National Park is so surrounded by towering cliffs that the sun shines on it only a short time in the year, and icebergs float on the water all the year round.

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