CHEMISTRY

Heavy Hydrogen Discoverer Isolates Heavy Sulfur

New Method for Studying Function of Sulfur in Body Available With Production of New Isotope

NEW methods of analysis and new means of studying the function in the human body of sulfur, as essential for life as iron, phosphorus or iodine, will be possible with heavy sulfur, according to chemists attending the 100th meeting of the American Chemical Society in Detroit.

At a session of the Society on Tuesday afternoon, the production of heavy sulfur for the first time was described by Drs. David W. Stewart and Karl Cohen, of Columbia University. The researches were conducted under the direction of Dr. Harold C. Urey, head of the chemistry department, who discovered heavy hydrogen in 1934, for which he received the Nobel prize. Later he prepared heavy forms of oxygen and other elements.

Most elements consist of a mixture of several isotopes. These are made of atoms of different weights, though having similar chemical properties. Ordinary sulfur contains four; 95% being of weight 32; 4% of weight 34, which is the isotope now isolated; 1% of weight 33 and one part in 6,000 of weight 36.

Separation of the isotope, at a cost of $1,500 per ounce as compared with a cent an ounce for common sulfur, was achieved with Dr. Urey's "counter-current scrubbing method," previously used to separate isotopes of carbon and nitrogen.

A gas, sulfur dioxide, was passed upwards and a liquid, sodium hydrogen sulfite, was allowed to flow downwards through 150 feet of bent glass tubing. Sulfur 34 is more soluble in the liquid than the other varieties. Therefore, at the end of the process the liquid in the bottom contained about a quarter of the heavy isotope.

Researches are now being made by Dr. Vincent du Vigneaud, professor of biochemistry in the Cornell University School of Medicine, using heavy sulfur to determine the role of the element in bodily chemistry. Using the isotope, sulfur atoms can be tagged at the start of an experiment, and identified at intermediate stages, and at the end of the reaction. This method promises also to be of use in tracing sulfur in complicated organic reactions which are not concerned with living organisms.

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Coal and Oil Are Synthesized From Plant Carbohydrates

FROM farms instead of mines and oil wells will come the coal and gasoline of the future, Dr. Ernst Berl, research professor at Pittsburgh's Carnegie Institute of Technology, predicted at the 100th meeting of the American Chemical Society in Detroit.

Already, in his laboratory, crude oil, bituminous coals, asphalts and coke have been produced from materials like corn, wood, seaweed, leaves and molasses. These are rich in compounds known as carbohydrates, of which starch and sugar are examples. The resulting coals, asphalts and oils, he said, have exactly the same properties as the natural products. So far anthracite coal has not been made, but this will be attempted in the near future.

Great advantage of the new process is that a fuel source is provided that can constantly be renewed. Nature's supplies of coal and oil are fixed. When exhausted they will not be replaced until untold ages have passed. Dr. Berl stated that he could make coal or oil from carbohydrates in from one to two hours.

The method, he said, is "rather simple." It involves heating the carbohydrate materials under pressure with limestone. At present, it cannot compete in price with crude oil obtained from the ground, but, he declared, it is cheaper than making gasoline from coal by the hydrogenation process, which requires expensive high-pressure apparatus.

"In the United States at present there is no industrial interest in producing crude oil from cotton, wood, leaves, grass or molasses," said Dr. Berl, "but the time is not very far away when most of the easy-to-produce oil will be exhausted. Then, from all kinds of carbohydrate-containing raw materials, which the farmer can produce to a large extent, important amounts of asphalts and crude oils can be produced at prices which can certainly compete with other methods of the future. The transformation of carbohydrates furnishes an excellent liquid fuel which, thanks to the rather large amount of aromatic hydrocarbons, shows a rather high anti-knock value."

Estimates have been made that the United States possesses about 60% of the world's coal reserves and more than 50% of its oil reserves.

"We have coal for perhaps 3,000 years and probably oil also for at least one generation," he continued. "In the future, when the low-priced crude oil will have been exhausted, methods like the distillation of oil shale and the hydrogenation of coal and carbon monoxide will be carried out. To these methods the production of different classes of substances with asphalt and crude oil properties from carbohydrates can be added. Especially in warmer climates carbohydrates are produced much in excess of what mankind would need for foodstuffs, textiles, explosives and lacquers."

Dr. Berl held no hope for a farmer of the future making his own gasoline, for, he said, the process needs high-pressure apparatus. He would have to send his material to a central plant, as he does now with beets for beet sugar.

An important theoretical point about Dr. Berl's studies is that old ideas of the formation of coal and oil in nature are disproved. It has been held that lignin, the woody skeleton of trees, was the main source of all solid fuels. Also, it has been suggested, natural oils were formed from dead fish. Dr. Berl says that the work in his laboratory has established that true bituminous coals are produced in nature from the plant carbohydrates, and not from the lignin, and also that asphalts are the parent material of crude oil.

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It is reported that flowers are being replaced with *potato plants* in public gardens of Oslo, Norway.