

Physics. — "*Helium in earth-gases of the petrol sources*". By Dr. J. CLAY.
(Communicated by Prof. H. KAMERLINGH ONNES).

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Both from a geological and a technical point of view it is of importance to know whether helium occurs in the earth gases of the petrol sources in India. In other places namely sources have been found containing so much helium that the balloons of large airships can be filled with it.

The Bat. Petrol. Company was so kind to take carefully considerable quantities of gases from their sources and to present these to the physical laboratory of Bandoeng for our researches.

Some samples were first freed from their and expediated in shut drums of 5 L. but most samples were transported in large drums of 100 L. or in steel high pressure tubes.

In all cylinders care was taken for a sufficient overpressure (shut by water) so that no air could enter.

In order to investigate spectroscopically the presence of helium in the gas, we had to be sure that it did not contain traces of hydrogen, as the hydrogen spectrum can render that of helium imperceptible. This was the greatest difficulty with most samples.

The absorption of the hydrogen by palladium proved to be insufficient. As the only method to get rid of the hydrogen we mixed the gas with a considerably surplus of oxygen and then burned the hydrogen in a Drehschmidt capillar tube.

Thereto we mixed the gas with five times its volume of oxygen and made it flow through the capillar so often till no longer a decrease of volume was observed.

Then the remaining oxygen was taken away by pyrogallol solution, while the carbonic acid was absorbed by a potassium solution. Finally the remaining gas was led into a reservoir of known volume, while the pressure could be read. Then the gas was let into that part of the apparatus where at the temperature of liquid air it comes in contact with cocosnutcoal. Here all gases were absorbed except helium. Though at atmospheric pressure the absorption of helium at the temperature of liquid air amounts to 20%, it may be neglected at the low pressure we finally had in the apparatus (surely below 1 mm. mercury), the absorption being proportional to the gaseous pressure. The latter could be measured in a MAC LEOD vacuummeter. In order to treat a large quantity of gas the reservoir was generally filled 5 times, while the new quantities were

introduced while it contained still the gas left when the coal is regenerated by heating and evacuation by the air pump.

The finally obtained gas rest was then collected in a fresh tube with coal and brought at the temperature of liquid air.

Each time the nature of the gas was examined in a spectral tube by means of a HILGER spectrograph (of constant deviation) the spectrum being compared with that of pure helium. In this way helium was stated in the samples from

Ledokput	158	Tjepoe	Java
Ledokput	135	"	"
Banjoeasin	17	"	"
Djerigi put	15	"	"
Tg. Lontar	I, V, VI	Pladjoe	Sumatra.

The following gases contain small traces of helium, probably still less than the given percentages. The latter reserve must be made as very small traces of other gases might be present, though these have not been stated spectroscopically. Always the mercury spectrum was visible. The pressure of the mercury vapour however is not measured in the MAC LEOD vacuummeter:

Gaboes	0,0014 ‰	Tjepoe	Java
Semanggi 66.	0,0013 ‰	"	"
Semanggi 62.	0,0017 ‰	"	"
Banjoebang 15.	0,0020 ‰	"	"
Nglabo	0,0033 ‰	"	"
Zuid-Perlak	0,0030 ‰	Pankalanbrandan	Sumatra
P. Soesoe	0,0015 ‰	"	"
Papa Drien	0,0006 ‰	"	"

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