At 70—90° K adsorption of nitrogen on a glass surface is measurable; hence it can be expected that the accommodation coefficient $a_{1,\infty}$ will be equal to unity. In good agreement with this for N_2 $a_{1,\infty} = 1.02$ is found.

Generally the accommodation coefficient with regard to glass appears to increase with decreasing temperature, to a degree which appears to be connected with the critical temperature.

The table below illustrates this connection, when σ represents the increase of $a_{1,\infty}$ from 0° C to 70—90° K divided by unity minus $a_{1,\infty}$ at 0° C, the latter difference being the maximum increase which would be possible.

He	$(a_{1,\infty})_{0^\circ C} = 0.336$;	$(a_{1,\infty})_{70-90^\circ K.} = 0.383$;	$\sigma = 0.07$;	$T_{crit.} =$ 5.2° K
Ne	0.283	0.555	0.38	33.0
H_2	0.670	0.803	0.40	44.0
N_2	0.855	1.02	1.00	126.0

On the other hand the critical point can be assumed practically as about the upper limit of the region of measurable adsorption on glass, as follows from the adsorption measurements on He, Ne, and later on H_2 and N_2 on glass.

Combining both facts, we can state the relationship between accommodation-coefficient and adsorption schematically as follows:

1. $T < T_{crit.}$: adsorption, $a_{1,\infty} = 1$;
2. $T > T_{crit.}$: no measurable adsorption; at least for a certain temperature range from the critical temperature upwards a rather large increase of $a_{1,\infty}$ can be conceived as an indication of approaching measurable adsorption.

Physics. — *On the scattering of neutrons in matter.* (III). By Prof. L. S. ORNSTEIN. (Communication from the Physical Institute of the University of Utrecht).

(Communicated at the meeting of October 31, 1936).

Let by one or more sources neutrons of an energy ε_0 be produced in an infinite layer of protons. We will investigate the distribution law for the energy. Let the production begin at a time $t=0$.

Consider the total number of neutrons of energy ε_0, that is those which have suffered no collision.

For N_0 we get the equation:

$$\frac{d N_0}{d t} = q - \alpha (\varepsilon_0) N_0$$

and therefore when at $t=0 \qquad N_0=0$

$$N_0=\frac{q}{a_0}\,(1-e^{-\alpha(\varepsilon_0)t}).$$

In the stationary state which is approximately reach for times large compared with $\frac{1}{a\,(\varepsilon_0)}$ we get

$$N_0=\frac{q}{a_0}.$$

Now we must determine the number of neutrons which suffered only one collision; for this group we must specify the energy between the limits ε and $\varepsilon+d\varepsilon$. Let $N_1(\varepsilon)d\varepsilon$ represent this number. We obtain for this number the differential equation:

$$\frac{d\,N_1(\varepsilon)}{dt}\,d\varepsilon=\frac{a(\varepsilon_0)\,v_0(\varepsilon_0)\,N_0\,d\varepsilon}{\varepsilon_0}-N_1(\varepsilon)\,a(\varepsilon)\,d\varepsilon.$$

Where $\frac{d\varepsilon}{\varepsilon_0}$ is the probability for the transition ε_0 to ε and $v(\varepsilon_0)$ the probability for the neutron not to be captured at the collision.

The stationary solution is:

$$N_1(\varepsilon)=\frac{1}{a(\varepsilon)}\,\frac{a(\varepsilon_0)\,v_0(\varepsilon_0)}{\varepsilon_0}\,N_0=\frac{q}{a(\varepsilon)}\,\frac{v\,(\varepsilon_0)}{\varepsilon_0}.$$

The total number which suffered only one collision amounts to:

$$N_1=\frac{q\,v\,(\varepsilon_0)}{\varepsilon_0}\int\limits_0^{\varepsilon_0}\frac{d\varepsilon}{a\,(\varepsilon)}.$$

For the number of neutrons which suffered two collisions and have their energy between ε and $\varepsilon+d\varepsilon$ we get:

$$\frac{d\,N_2(\varepsilon)}{dt}=-a(\varepsilon)\,N_2(\varepsilon)+\int\limits_{\varepsilon}^{\varepsilon_0}N_1(\varepsilon')\,a(\varepsilon')\,v(\varepsilon')\,\frac{d\,\varepsilon'}{\varepsilon'}.$$

For the stationary state:

$$N_2\,(\varepsilon)=\frac{1}{a\,(\varepsilon)}\int\limits_{\varepsilon}^{\varepsilon_0}N_1(\varepsilon')\,a(\varepsilon')\,v(\varepsilon')\,\frac{d\,\varepsilon'}{\varepsilon'}$$

$$=\frac{1}{a\,(\varepsilon)}\int\limits_{\varepsilon}^{\varepsilon_0}\frac{v\,(\varepsilon_0)}{\varepsilon_0}\,q\,v\,(\varepsilon')\,\frac{d\,\varepsilon'}{\varepsilon'}$$

$$=\frac{1}{a\,(\varepsilon)}\,\frac{q\,v\,(\varepsilon_0)}{\varepsilon_0}\int\limits_{\varepsilon}^{\varepsilon_0}\frac{v\,(\varepsilon')\,d\,\varepsilon'}{\varepsilon'}.$$

The total number which suffered only two collisions is:

$$N_2 = \frac{q\, v(\varepsilon_0)}{\varepsilon_0} \int\limits_0^{\varepsilon_0} \frac{d\varepsilon}{\alpha(\varepsilon)} \int\limits_{\varepsilon}^{\varepsilon_0} \frac{v(\varepsilon')}{\varepsilon'}\, d\varepsilon'.$$

The number of neutrons which suffered n collisions and possess an energy between ε and $\varepsilon + d\varepsilon$ is $N_n(\varepsilon) d\varepsilon$ with:

$$N_n(\varepsilon) = \frac{q\, v(\varepsilon_0)}{\varepsilon_0\, \alpha(\varepsilon)} \int\limits_{\varepsilon}^{\varepsilon_0} \frac{v(\xi_1)\, d\xi_1}{\xi_1} \int\limits_{\xi_1}^{\varepsilon_0} \frac{v(\xi_2)\, d\xi_2}{\xi_2} \cdots \int\limits_{\xi_n}^{\varepsilon_0} \frac{v(\xi_n)\, d\xi_n}{\xi_n}.$$

The total number N_n is given by

$$N_n = \frac{q\, v(\varepsilon_0)}{\varepsilon_0} \int\limits_0^{\varepsilon_0} \frac{1}{\alpha(\xi_1)}\, d\xi_1 \int\limits_{\xi_1}^{\varepsilon_0} \frac{v(\xi_2)}{\xi_2}\, d\xi_2 \ldots .$$

The total number of neutrons of an energy between ε and $\varepsilon + d\varepsilon$ is given by $\Phi(\varepsilon) d\varepsilon$ where $\Phi(\varepsilon)$ is expressed by the formula

$$\Phi(\varepsilon) = \sum_1^\infty N_n(\varepsilon) = \frac{q\, v_0}{\varepsilon_0\, \alpha(\varepsilon)} \left(1 + \int\limits_{\varepsilon}^{\varepsilon_0} \frac{v(\xi_1)\, d\xi_1}{\xi_1} + \int\limits_{\varepsilon}^{\varepsilon_0} \frac{v(\xi_1)\, d\xi_1}{\xi_1} \int\limits_{\xi_2}^{\varepsilon_0} \frac{v(\xi_2)\, d\xi_2}{d\xi_2} + \ldots \right)$$

The infinite series between the brackets can be calculated. Putting this series $f(\varepsilon)$, we know that $f(\varepsilon_0) = 1$, and it is easily seen that

$$\frac{d f(\varepsilon)}{d\varepsilon} = - \frac{v(\varepsilon)}{\varepsilon} f(\varepsilon)$$

so that we get

$$f(\varepsilon) = e^{-\int\limits_{\varepsilon_0}^{\varepsilon} \frac{v(\xi)}{\xi} d\xi} = e^{\int\limits_{\varepsilon}^{\varepsilon_0} \frac{v(\xi)}{\xi} d\xi}.$$

For $\Phi(\varepsilon)$ we thus obtain:

$$\Phi(\varepsilon) = \frac{q\, v(\varepsilon_0)}{\varepsilon_0\, \alpha(\varepsilon)} e^{\int\limits_{\varepsilon}^{\varepsilon} \frac{v(\xi)}{\xi} d\xi}.$$

In order to obtain the probability for the energy between ε and $\varepsilon + d\varepsilon$ $P(\varepsilon) d\varepsilon$ we ought to divide by the total number of particles $N_0 + N_1 + N_2 + \ldots$

This sum can be obtained in the following way. The first term is $\frac{q}{a_0}$, then results

$$\frac{q\,v_0}{\varepsilon_0}\left(\int_0^{\varepsilon_0}\frac{d\varepsilon}{a(\varepsilon)}+\int_0^{\varepsilon_0}\frac{d\varepsilon}{a(\varepsilon)}\int_\varepsilon^{\varepsilon_0}\frac{v(\varepsilon')}{\varepsilon'}\,d\varepsilon'+\ldots\right)$$

or

$$\frac{q\,v_0}{\varepsilon_0}\int_0^{\varepsilon_0}\frac{d\varepsilon}{a(\varepsilon)}\left(1+\int_\varepsilon^{\varepsilon_0}\frac{v(\varepsilon')}{\varepsilon'}\,d\varepsilon'+\ldots\right)$$

which is

$$\frac{q\,v_0}{\varepsilon_0}\int_0^{\varepsilon_0}\frac{d\varepsilon}{a(\varepsilon)}\,e^{\int_\varepsilon^{\varepsilon_0}\frac{v(\xi)}{\xi}\,d\xi}\,.$$

Dividing by the total number, we get for $P(\varepsilon)$

$$P(\varepsilon)=\frac{\frac{v(\varepsilon_0)}{\varepsilon_0\,a(\varepsilon)}\,e^{\int_\varepsilon^{\varepsilon_0}\frac{v(\xi)}{\xi}\,d\xi}}{\frac{1}{a(\varepsilon_0)}+\frac{v(\varepsilon_0)}{\varepsilon_0}\int_0^{\varepsilon_0}\frac{d\varepsilon}{a(\varepsilon)}\,e^{\int_\varepsilon^{\varepsilon_0}\frac{v(\xi)}{\xi}\,d\xi}}\,.$$

A result which changes the notations analogous to that of FERMI (ZEEMAN-book).

The same result can be obtained in a somewhat different way. If the source q is emitting since the time $-\infty$ and we want to know the number of neutrons at the time t which suffered zero, one, etc. collisions, we get for N_0:

$$N_0=q\int_{-\infty}^{t}d\xi\,e^{-\alpha(\varepsilon_0)(t-\xi)}=\frac{q}{a(\varepsilon_0)}\,.$$

For N_1 we get

$$N_1=q\int_0^{\varepsilon_0}d\varepsilon_1\int_{-\infty}^{t}d\xi\,e^{-\alpha(\varepsilon_0)(t_2-\xi)}\,a(\varepsilon_0)\,dt_1\,v(\varepsilon_0)\,e^{-\alpha(\varepsilon_1)(t-t_1)}\,\frac{d\varepsilon_1}{\varepsilon_0}$$

or

$$N_1=\frac{q\,v(\varepsilon_0)}{\varepsilon_0}\int_0^{\varepsilon_0}\frac{d\varepsilon}{a(\varepsilon)}\,.$$

In the same way we get

$$N_2 = q \int_0^{\varepsilon_0} d\varepsilon_2 \int_{\varepsilon_2}^{\varepsilon_0} \frac{d\varepsilon_1}{\varepsilon_1} \,.$$

$$. \int_{-\infty}^{t} d\xi \, e^{-\alpha(\varepsilon_0)(t_1-\xi)} \, a(\varepsilon_0) \, v(\varepsilon_0) \, dt_1 \, e^{-\alpha(\varepsilon_1)(t_2-t_1)} \, a(\varepsilon_1) \, v(\varepsilon_1) \, dt_2 \, . \, e^{-\alpha(\varepsilon_2)(t-t_2)}$$

which integrated gives for N_2 the same expression as we have found with the first method.

Mathematics. — *Generalization of an inequality of* KNOPP. By J. G. VAN DER CORPUT.

(Communicated at the meeting of October 31, 1936).

In this note $a_0, a_1, \ldots$ are supposed to be $\geqq 0$, not all zero, $q > 0$ and $0 < u \leqq 1$ and I write

$$F(u) = \sum_{n=0}^{\infty} u^n \left(a_0^{\binom{n}{0} q^n} \, a_1^{\binom{n}{1} q^{n-1}} \ldots a_n^{\binom{n}{n} q^0} \right)^{\frac{1}{(q+1)^n}} .$$

KNOPP [1]) has deduced the inequality

$$F(1) < (q+1) \sum_{n=0}^{\infty} a_n, \quad \ldots \ldots \ldots \quad (1)$$

provided that the last series converges; for any fixed q the constant $q+1$ is the best possible.

As $(q+1)v^q - q v^{q+1}$ is in the interval $0 \leqq v \leqq 1$ a continuous monotonic increasing function of v, assuming for $v=0$ and $v=1$ the values 0 and 1, there is one and only one v $(0 \leqq v \leqq 1)$ such that

$$(q+1)v^q - q v^{q+1} = u^{q+1}. \quad \ldots \ldots \ldots \quad (2)$$

In this paper I will prove:

$$F(u) \leqq \frac{(q+1)v^q}{u^{q+1}} \sum_{n=0}^{\infty} a_n \quad \ldots \ldots \ldots \quad (3)$$

provided that the last series converges; for any fixed u und q the constant $\dfrac{(q+1)v^q}{u^{q+1}}$ is the best possible.

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[1]) K. KNOPP, Ueber Reihen mit positiven Gliedern (Zweite Mitteilung), Journal Lond. Math. Soc. **5** 13—21, (1930).