the impact of Li^+ ions had no effect upon the measurements since their measured velocity was too small to produce excitation in Ne. The results were the same no matter whether the potential of the collector was the same as, slightly greater, or slightly less than the plate containing the collimating slit.
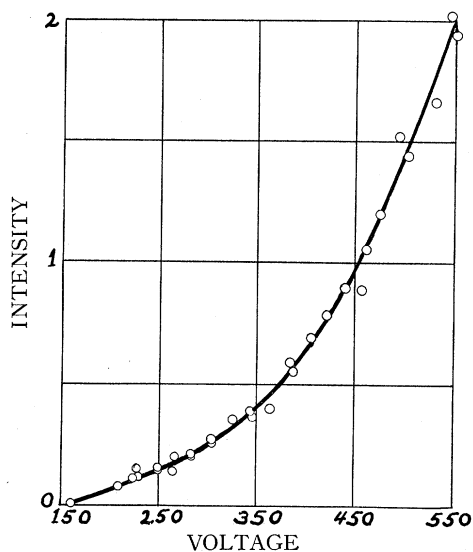

FIG. 1.

The curve shown in Fig. 1 is a composite of four sets of readings. The curves were adjusted by fitting the 386 volt point. The light intensity zero indicates the minimum light intensity observable.

It is interesting to note that light excitation by the Li^+ ions in Ne can be observed approximately 150 volts below the potential at which Beeck and Mouzon observed the beginning of ionization. The curve showing the variation of light intensity with voltage approaches the axis in an asymptotic fashion, whereas Beeck and Mouzon's ionization curve approaches the axis sharply. The fact that Beeck and Mouzon observed a sharp onset of ionization may be due to the fact that the accuracy of their method is limited by the sensitivity of the electrometer for collecting the ion current. In their apparatus the appearance of negative current was observed and taken to indicate the ionization of the gas. However, photoelectrons set free by the radiation excited may have been present at much lower voltages.

These measurements on excitation of light by alkali ions in the noble gases are being extended and a more complete report will be published in the near future.

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The Plasticity of Rocksalt and Its Dependence upon Water

In a letter with the same title Mr. Bowling Barnes communicates the fact that rocksalt crystals after being soaked in water and then dried on the surface, show infrared absorption which depends on the water soaked into the crystal.[1] The suggestion that the entrance of water into the rocksalt crystals is possible and, moreover, may be connected with the high plasticity of "wet" rocksalt, first was introduced by me[2] and not by Polanyi and Ewald, as Barnes incorrectly states. In collaboration with Quittner, moreover, I have shown that the electric conductivity of rocksalt increases by soaking and subsequent drying of the surface. By this fact an indirect proof of the entrance of water into the crystal was given.[3] The direct spectroscopic finding of water in the crystal by Barnes is a most satisfactory proof and an essential completion of our former results. It will be of great interest to measure the quantity of water per cc by the method of Barnes.

Whether the high plasticity of wet rocksalt can find sufficient explanation by these results, I, nevertheless, regard as uncertain.

The opinion of Joffé that the high tensile strength of wet crystals is induced by healing of the fissures of surface without any assistance of plasticity, we have disproved by experiment,[4] as well as the suggestion of Polanyi and Ewald that watering effects a reduction of the elasticity limit below the tensile strength of dry rocksalt. In fact, dry rocksalt has a limit of elasticity less than the tensile strength,[5] agreeing quantitatively with the limit of elasticity for wet rocksalt.[6]

Experiments on the rupture of dry rocksalt crystals[7] as well as on the dependence of tensile strength on temperature[8] indicate that rupture starts from surface fissures generated by plastic deformation. By levelling the surface of crystals such disturbances may be eliminated, with the result that rupture occurs only at markedly higher tensile stresses. Moreover, it must be remembered that the high tensile strength of wet rocksalt has been proved only for very small cross sections. If the translation planes in the case of small cross sections effect less significant surface

[1] R. B. Barnes, Phys. Rev. 43, 82 (1933).

[2] A. Smekal, Naturwiss. 16, 743, 1045 (1928); Phys. Zeits. 32, 187 (1931).

[3] F. Quittner and A. Smekal, Zeits. f. physik. Chemie B3, 162 (1929); Phys. Zeits. 32, 187 (1931).

[4] A. Smekal, Phys. Zeits. 32, 187 (1931); U. Heine, Zeits. f. Physik 68, 591 (1931).

[5] A. Smekal, Phys. Zeits. 31, 229 (1930); F. Blank, Zeits. f. Physik 61, 727 (1930).

[6] K. H. Dommerich, Zeits. f. Physik 80, 242 (1933); G. F. Sperling, Zeits. f. Physik 74, 476 (1932).

[7] A. Edner, Zeits. f. Physik 73, 623 (1932). H. Schönfeld, Zeits. f. Physik 75, 442 (1932).

[8] W. Burgsmüller, Zeits. f. Physik 80, xxx (1933).

cracks the increase in tensile strength might be connected with the rapid diminution of cross section by soaking in water.

The two last-mentioned explanations remain valid when the crystal surface is levelled with other solvents; on the other hand, it is possible that some solvents do not enter into the crystal. We have found that soaking rocksalt in concentrated sulfuric acid, as well as with H_2SO_4+25 percent SO_3 gives exactly the same results as with water, the same fact was proved for potassium iodide crystals when placed in water or methyl alcohol.[9] It would be of great importance if the spectroscopic method of Barnes could be extended to these cases.

The penetration of water into rocksalt crystals indicates the existence of fissures and crevices, as Barnes has pointed out. We have directly made visible such inhomogeneities of rocksalt by photoelectric[10] and ultramicroscopic methods.[11] Contrary to Barnes, however, we should not suppose a connection with the secondary structure of crystals as postulated by Zwicky. As recently shown by Orowan,[12] the calculations of Zwicky are incorrect. Incorrect[13] also are the statements of Buerger concerning changes of the translation mechanism in the group of alkali halides[14] which Zwicky claims as a proof of a secondary structure in rocksalt and the other alkali halides.[15] There is at present no theoretical or experimental support for the existence of a Zwicky secondary structure in rocksalt. As far as I see, the same situation holds for every other crystal. The beautiful results of Goetz with bismuth crystals are consistent with the existence of inhomogeneities which are not regularly distributed in the interior of crystals.

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  February 1, 1933.

[9] E. Rexer, Zeits. f. Physik **72**, 613 (1931).
[10] A. Smekal, Wien, Akad. Anz. 1926, p. 195; 1927, pp. 22, 46.
[11] E. Rexer, Zeits. f. Physik **76**, 735 (1932).
[12] E. Orowan, Zeits. f. Physik **79**, 573 (1932).
[13] Cf. W. Schütze, Zeits. f. Physik **76**, 135, 149 (1932).
[14] M. J. Buerger, Amer. Min. **15**, 114, 226 (1930).
[15] F. Zwicky, Helv. Phys. Acta **4**, 49 (1931).

The Mass of Be⁹ and the Atomic Weight of Beryllium

The mass of Be^9 was measured from five spectra as 9.0155 ± 0.0006 units on the $O^{16}=16$ scale. Be^{9+} was compared with C^+ by means of the ratios $Be^{9+} : C^{12+} : : C^{12+} : CH_4^+$. In Fig. 1, spectrum 1 is a reproduction of a contact print of one of the spectra of this type. The mass of Be^9 was also compared with that of Ne^{20++} by use of the approximate ratios $Be^{9+} : Ne^{20++} : : C^+ : CH^+$ as shown in Fig. 1, spectra 1 and 2. The value obtained from five

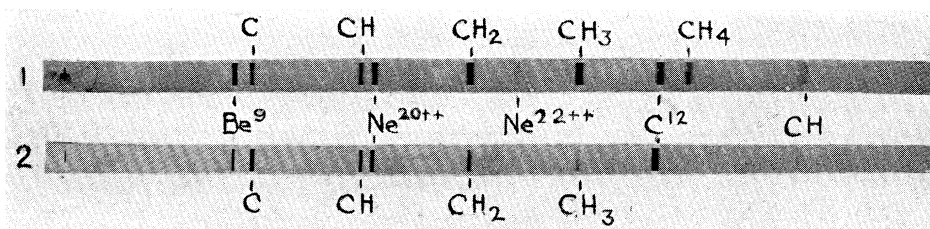FIG. 1. Mass-spectra of Be^9 and associated lines. Natural size.
(1) $Be^{9+} : C^{12+} : : C^{12+} : CH_4^+$. (2) $Be^{9+} : Ne^{20++} : : C^{12} : CH^+$.

spectra by using this latter ratio was 9.0154 ± 0.0008 when referred to $Ne^{20}=19.9967$.[1] The other reference masses were $C^{12}=12.0036$ and $H^1=1.00778$ as given by Aston.[2] Attempts to measure the mass of Be^9 by the ratios $Be^{9+} : O^{++} : : OH_2^+ : O^+$ have not succeeded so far as oxygen appears to be "cleaned up" in the presence of the $BeCl_2$ used to provide the beryllium ions. Except for the runs in which oxygen was present a satisfactory source of Be ions was provided by the evaporation from the cathode of anhydrous $BeCl_2$ with subsequent ionization in a discharge run in neon. This type of source has been described before.[3]

There are several interesting considerations which follow from this determination of the mass of Be^9.

(1) It appears improbable that the nucleus of Be^9 consists of two α-particles and one neutron,[4] or of two α-particles and one proton and one electron, as the sum of the masses of the suggested components is less than the mass of the stable Be^9 nucleus.

(2) Allowing for the presence of one part in 2000 of Be^8,[5] the atomic weight of beryllium on the chemical scale is 9.0130 ± 0.0007, which is considerably lower than the value

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[2] F. W. Aston, Proc. Roy. Soc. **A115**, 487 (1927).
[3] K. T. Bainbridge, Phys. Rev. **39**, 847, 1021 (1932).
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