Absorption by Gaseous Helium in the Extreme Ultraviolet*

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The absorption by gaseous helium at room temperature has been studied in the spectral region 550 A to 150 A. The measurements of Lee and Weissler have been confirmed and extended. The data are in substantial agreement with the theoretical predictions of Huang.

WE have examined the absorption coefficient of gaseous helium at room temperatures in the spectral region between 550 A and 150 A. Qualitative or semiquantitative determinations were made for the longer wavelengths and quantitative determinations were made in the region from 350 A to 150 A. Thus the work of Lee and Weissler,[1] who reported measurements between 780 A and 250 A, has been confirmed and extended to 150 A.

Experimentally the information was obtained by introducing a known pressure (of the order of a few mm of Hg) of helium into a vacuum spectrograph[2] and measuring the intensity reaching the photographic plates as a function of the wavelength. The helium pressure in the source chamber was maintained constant during all the runs so that the absorption path was the light path from the slit to the grating to the photographic plate. From two runs at different helium pressures, the absorption coefficient is readily calculated. The points reported represent averages from five independent determinations.

The results of our measurements as well as those of Lee and Weissler are shown in Fig. 1. Lee and Weissler report, and we have also observed, a sharp absorption edge at 504 A; this is due to the photoionization of the helium atom. On the long-wavelength side of this edge, there is observed a series of very narrow resonance lines corresponding to absorption involving the transitions $1s \rightarrow np$. The wavelengths of these lines are well known from emission studies.[3]

On the short-wavelength side of the edge ($\lambda < 504$ A), the absorption follows the theoretical curves to a reasonably good approximation. Theoretical curves have been calculated by Wheeler,[4] Vinti,[5] and Huang.[6] One of these[6] is reproduced in Fig. 1.

The probable error of the experimental points in the present data is 5.0 cm^{-1}. Considering this uncertainty and the general difficulty of measurements at these wavelengths, we feel that the agreement with the work of Lee and Weissler is remarkable.

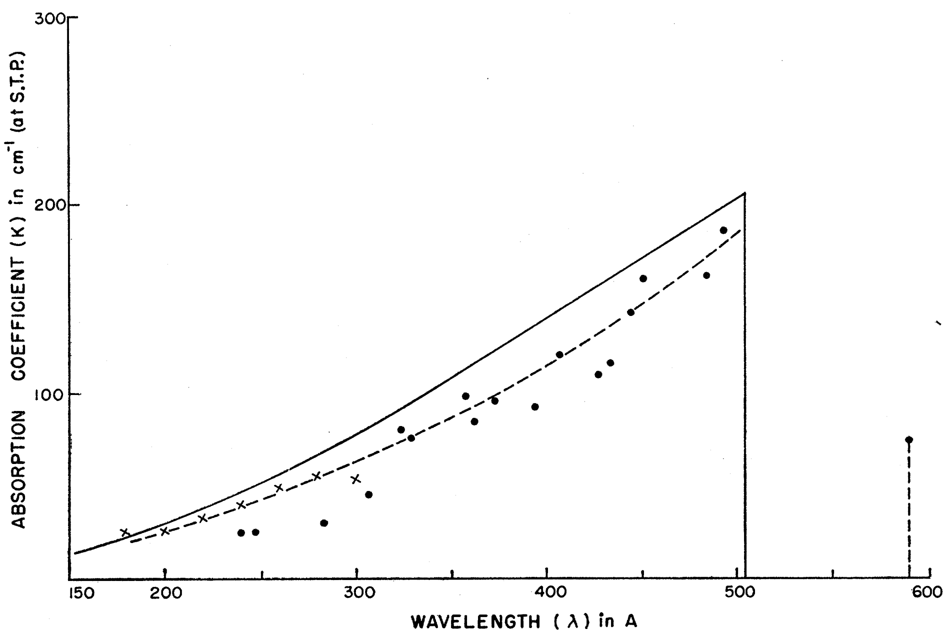

FIG. 1. Absorption of gaseous helium in the extreme ultraviolet. Theoretical curve (Su-Shu Huang) ———; experimental curve - - -. Experimental points: ● reference 1; × this work.

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[1] P. Lee and G. L. Weissler, Phys. Rev. **99**, 540 (1955).
[2] For a description of the instrument and details of absorption measurements, see C. J. Koester and M. P. Givens, Phys. Rev. **106**, 241 (1957) and R. W. Woodruff and M. P. Givens, Phys. Rev. **97**, 52 (1955).
[3] See, for example, W. H. Keesom, *Helium* (Elsevier Publishing Company, Amsterdam, 1942), p. 412.
[4] J. A. Wheeler, Phys. Rev. **43**, 258 (1933).
[5] J. P. Vinti, Phys. Rev. **44**, 524 (1933).
[6] Su-Shu Huang, Astrophys. J. **108**, 354 (1948).