Radial Lines in Laue Spot Photographs

When taking Laue spot photographs with a simple type of Laue spot camera which is described elsewhere,[1] radial lines were noticed apparently emanating from the edge of the shadow cast by the lead button which was used to prevent halation around the central spot. As the size of the button was reduced these radial lines became more definite and with a button of 5 mm diameter the result obtained with a 7-hour exposure is shown in Fig. 1 which was taken at approximately perpendicular incidence to a 100 plane of a natural sodium chloride crystal. The film was 5 cm from the crystal and the x-ray tube a Coolidge water-cooled type with tungsten target operated at about 40 kv peak and 15 ma. The same pattern was obtained with a natural potassium chloride crystal but not with Iceland spar, mica, zinc blend, fluorite, or gypsum, each perpendicular to a natural cleavage face. If the crystal is not as nearly perpendicular to a 100 plane for sodium chloride the same 8 radial lines show up but they begin on a rectangle rather than a square.

The result of a much longer exposure, 15 hours, is shown in Fig. 2 for the same crystal as for Fig. 1 but after it had been re-mounted some weeks later. The longer exposure was undertaken after the negatives had been shown to several men at the New York meeting in February and one of them had suggested that it might be due to a sort of crossed lattice effect, much as a similar pattern is obtained in the visible region with crossed gratings. Another observation on this plate which does not show up in the print, is the peculiar "structure" of those spots which appear exactly round. Instead of being of uniform intensity they have the appearance shown in Fig. 3, the rectangular portion being much darker and having its long side perpendicular to a radius from the center. Crystals from several sources far removed geographically were supplied by our geology department but no change in pattern was observed, i.e., no radial lines were exhibited except for sodium chloride and potassium chloride crystals, but invariably for these.

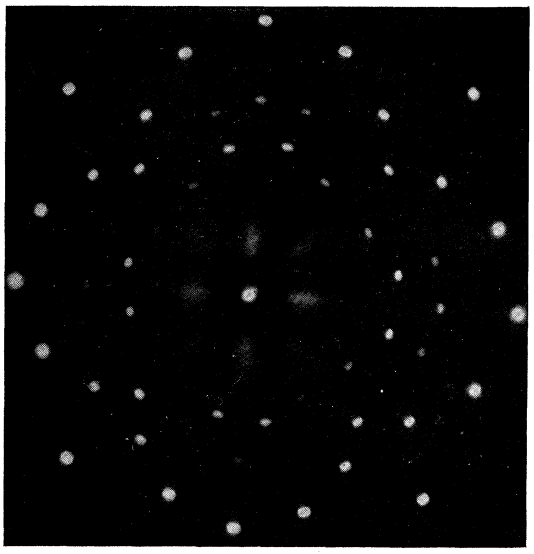

FIG. 1. Laue spot photograph taken at approximately perpendicular incidence to a 100 plane of a natural sodium chloride crystal.

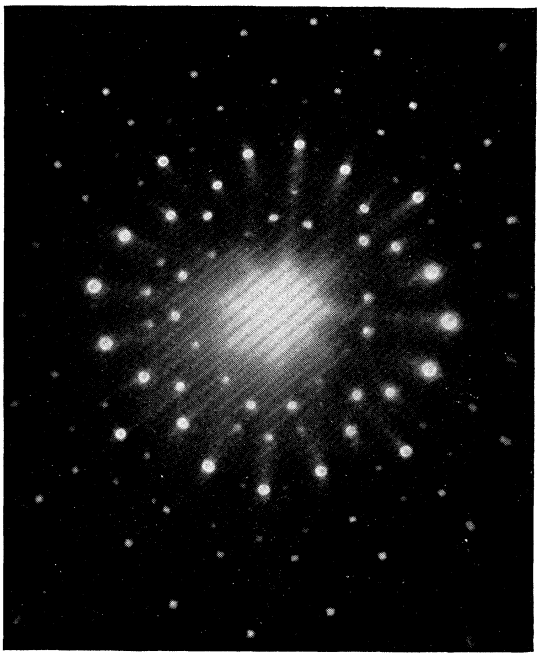

FIG. 2. Result of a 15-hour exposure with the same crystal as in Fig. 1.

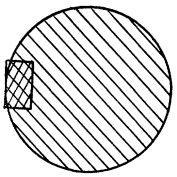

FIG. 3.

In order to obtain comparison photographs sodium chloride and potassium chloride crystals were grown from a saturated solution of the respective salts. Chemically pure salts were first allowed to crystalize and these crystals then used to form a second saturated solution from which the crystals finally used were obtained. These crystals were not clear although apparently well formed. Nevertheless the potassium chloride crystals used showed a pattern exactly like that shown in Fig. 1. To date the author has had no explanation of these lines nor is he prepared to offer one at present. If they are due to strain why should they appear only with the two crystals mentioned and not with the others examined.

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April 2, 1938.

[1] A. P. R. Wadlund, "A Portable Laue Spot Camera," Am. Phys. Teacher, 6, 103 (1938).

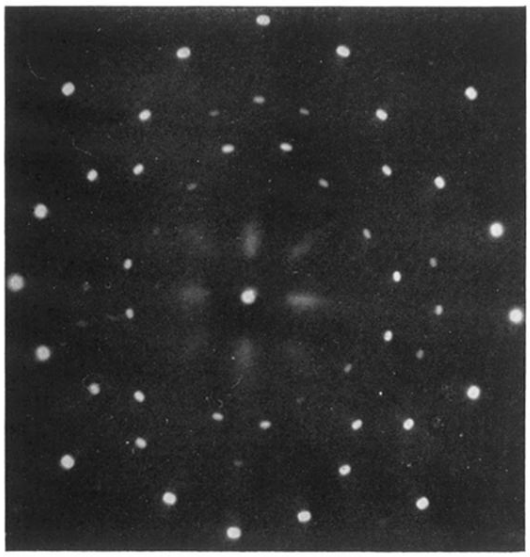

FIG. 1. Laue spot photograph taken at approximately perpendicular incidence to a 100 plane of a natural sodium chloride crystal.

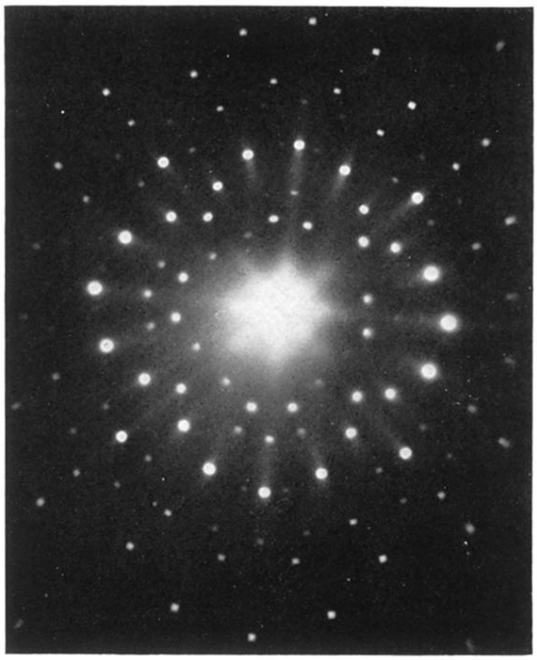

FIG. 2. Result of a 15-hour exposure with the same crystal as in Fig. 1.