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The Electrical Conductivity of NaCl, KI, and CsI under Shock Compression*

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It has been reported previously that certain ionic solids, including KI and CsI, exhibit metallic behavior under shock compression in the neighborhood of 200 kbar.[1] We have corroborated the observation that the conductivities of these salts increases dramatically to values on the order of 1 $(\Omega\text{-cm})^{-1}$ over a relatively small pressure range. In an effort to determine the conductivity mechanism, we have attempted to determine its temperature dependence by heating specimens prior to shocking. This is necessarily an inexact procedure because of our inability to measure shock temperatures and because of the uncertainty in calculating shock temperatures of several thousand degrees. Nevertheless we must conclude from our results that an hypothesis that the high conductivity is ionic in nature and is due to melting is as plausible as the earlier hypothesis that the high conductivity is produced by a decrease of the band gap and is electronic in nature. The conductivity of single crystal NaCl remains $< 10^{-4}$ $(\Omega\text{-cm})^{-1}$ (the lower limit of measurement) when shocked to 230 kbar from room temperature.

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1. B. J. Alder, Solids Under Pressure, McGraw-Hill, New York, 1963, p. 385