



Two types of electric phenomena in mechanically loaded solids

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There are two electromagnetic effects induced by mechanical loading of materials: electric polarization and electromagnetic radiation. Electric polarization of solids under loading is the phenomenon where the centers of oppositely charged ions become detached. The scanty investigations in this field show that such an effect could be achieved by percussion drilling, impacts or even due to accelerated or non-homogeneous material loading. Although the mechanism of this phenomenon is not yet understood, it is clear that polarization increases when material is under stable conditions. Quantitative measurement of this phenomenon is quite complicated because it is a relatively slow process.

The second phenomenon of electromagnetic radiation (EMR) is better understood. It is known that it is induced when material becomes unstable during fracture. This phenomenon enables us to evaluate fracture dimensions and velocity. It has been used in the lab and in mines to estimate the intensity of fracturing, blasting and rock bursts. It is expected that EMR measurement should also enable earthquake forecasting.

These two phenomena are highly related to one another because fracturing, being the source of EMR breaks the stability of the material and causes depolarization. Thus EMR measurement of this depolarization allows a quantitative observation of the charge distances.