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Piezo-Electric Hypothesis for Hot Spot Formation Leading to Detonation[1] D.S. MONTGOMERY, M.J. CAWKWELL, K.J. RAMOS, Los Alamos National Laboratory — The impact to detonation sequence has been a long standing mystery in high explosives (HE). It is widely recognized that detonation begins in spatially-localized "hot spots" where chemistry initiates, but the physical mechanisms leading to hot spot formation are unknown. Here we revisit an old hypothesis, first suggested by Maycock and Grabenstein [1], that piezo-electric effects may be the cause of hot spot formation since most solid HE materials are observed to be highly piezo-electric. In this scenario, shock-induced pressure leads to electric fields of 100's MV/m, sufficient for dielectric breakdown and breaking chemical bonds, rather than via thermal effects. Extrapolation of statically measured piezo-electric coefficients for several HE materials suggests that shock pressures $>$ 100-kbar might lead to field strengths $>$ 100 - 1000 MV/m, but no definitive experimental proof has been obtained to support this. Here we discuss possible experiments to test this hypothesis by measuring the electric field in dynamic HE experiments correlated with hot spot formation.

[1] J.N. Maycock, D.E. Grabenstein, Science **152**, 508 (1966).

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