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Introduction: The quantification of the transient pressure and temperature conditions that prevailed during shock events in terrestrial and extraterrestrial materials is essential for understanding the dynamics of the solar system formation and evolution. Shock processes can be studied at various levels: morphological traces (craters), transformations in rocks and minerals, comparisons between both dynamic and static experiments and natural assemblages.

Results: Relations linking the size of the impactor and its velocity combined with the diameter of the impact crater show that in the asteroidal belt typical shock durations range from the millisecond to less than 10 seconds. The Hugoniot-Rankine equations show that for a shock pressure of 80 GPa a 60 km-sized impactor will induce a shock lasting 10 seconds. In the classical scale of shock metamorphism the stage S6 corresponds to pressures in excess of 55 GPa and to temperatures around 2000 K. For these conditions, simple calculations show that olivine crystals should be partially to completely transformed into high-pressure polymorphs in less than 2 seconds. Such massive mineral transformations in the bulk of shocked meteorites have never been observed. We discuss the record of the (P,T,time) shock history from the presence of high-pressure minerals in shocked meteorites. They result either from solid-state reactions in a perfect pressure medium (chondritic melt) or from the crystallization of a melt at high pressures [1]. They are confined in the shear melt veins, melt pockets or close to their walls. They provide the only precise record of the (P,T,time) history of the shock. Several examples concerning the olivine-wadsleyite-ringwoodite and the pyroxene-majorite-akimotoite system will be presented. These assemblages altogether cannot form or survive a peak pressure of at least 70-80 GPa [2]. The inferred peak shock pressure for most S6 shocked chondrites or Martian meteorites lie between 20 and 30 GPa for temperatures around 2000 K [3]. The inferred shock duration varies between 10 ms and a few seconds. The peak shock pressure is by far much less than that proposed by the classical shock pressure scale [4].

Finally the recent finding of the Li-niobate high-pressure polymorph of FeTiO₃ ilmenite in shocked gneisses in the Ries crater [5] unambiguously demonstrates once more the correct use of static experimental results for estimating the formational conditions of natural dynamically produced analogues.

Conclusions: Consistency among all the approaches used to infer the P,T,t history of shocked rocks is needed. The classical classifications of shock degree in rocks are incompatible with the most recent discoveries of high-pressure mineral assemblages in meteorites and thus need to be fundamentally revised. We suggest that the classical scale must be recalibrated using the P,T conditions recorded in the shear melt veins.