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Iron damage and spalling behavior below and above shock induced alpha $\alpha \Leftrightarrow \varepsilon$ phase transition CHRISTOPHE VOLTZ, FRANÇOIS BUY, GILLES ROY, CEA — The study of dynamic damage and fracture of iron has been undertaken below and above phase transition by series of time resolved experiments using both light gas launcher and powder gun. Shock wave tests were conducted by symmetrical impacts of high purity iron. To reveal the material behavior we have done shock experiments where the target is covered with a window in order to limit release amplitude and to avoid specimen fragmentation. Metallurgical analysis of soft recovered samples yields informations about damage and fracture processes related to thermo-mechanical loading paths. Tests conducted without window allow studying effects of both phase change and release transition. Optical and SEM characterizations lead us to observe several modes of damage: brittle, ductile diffuse with void growth and heavily localized smooth one. These figures are related with: material where $\alpha \Leftrightarrow \varepsilon$ occurs or interfaces between transformed and not transformed iron. Simulations are performed with the 1D CEA hydrocode Hesione to compare experimental data with numerical results. We explain post-mortem observations by the complex shock wave structure: P1 and P2 shock fronts associated with some corresponding shock release during unloading stages.

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