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Effect of Phase Transitions of Chemically Inert Additives on Detonation Properties of Composite Explosives. RAAFAT GUIRGUIS, Naval Surface Warfare Center, Indian Head — One-dimensional calculations are used to investigate the effect of phase transitions of chemically inert additives on the detonation properties of high explosives. The resulting small changes in volume of the inert materials can lead to significant changes in the detonation properties when the phase transitions occur within the reaction zone where even the gaseous decomposition products are at high density. The predictions confirm the experimentally observed shift in detonation velocity that occurs when the initial density exceeds a threshold value at which the resulting pressures in the reaction zone correspond to a polymorphic phase transition of the additives. The shift in detonation velocity mostly depends on the sign of the change in volume induced by the transition and to a lesser extent on the sign of the energy released during the transition. Phase transitions causing an increase in volume yield a positive shift in the detonation velocity that is augmented or reduced depending on whether the transition is an exothermic or an endothermic one. The positive shift in detonation velocity is increased when the compressibility of the inert additives is decreased.

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