SURFACES AND INTERFACES OF HIGH EXPLOSIVES PROBED BY NONLINEAR OPTICAL SPECTROSCOPY

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The surfaces and interfaces of plastic explosives (PBX 9501) were studied using vibrational sum-frequency generation spectroscopy (SFG). SFG is a surface and interface selective nonlinear optical spectroscopy technique with which we study the interfaces within plastic explosive. We are interested in the explosive crystal to plastic binder interface and also the explosive crystal to explosive crystal interface. We initially studied the surfaces of the components of plastic explosives i.e. HMX crystals and a plastic binder, Estane. Our initial results showed that solution grown β-HMX crystals has small deposits of the δ-HMX isomorphs on its surface. We also found that rapid evaporation from droplets of HMX solution produces nanocrystals of only δ-HMX; presumably because the polar boat conformation of δ-HMX is stabilize by polar solvents. A detail study of the surface vibrational modes of β-HMX was also carried out on a cleaved HMX crystal.