Interstellar dust grain destruction by gamma ray bursts: a proposal for a NIF experiment

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We propose to investigate the effects of intense x-ray radiation on interstellar medium (ISM) and interplanetary dust particle (IDP) analogs. Dust grains play a key role in radiation transfer and cooling of ISM molecular clouds and thereby in the formation of galaxies, stars and planets. Energetic feedback from a variety of sources, including hot stars, supernovae, active galactic black holes and Gamma Ray Bursts (GRBs), can have a significant effect on these grains. For example, theoretical models suggest that x-ray emission associated with GRBs, the most energetic (collimated) explosions in the universe, might destroy ISM dust grains as far out as ~100 pc (~326 light years). There is no experimental data about how ISM and IDP, sub-micron materials behave under such intense bursts of x-rays. Here we propose to develop a concept for a NIF experiment to generate sufficiently high fluences ($erg \cdot cm^{-2}$) and fluxes ($erg \cdot cm^{-2} \cdot s^{-1}$) of x-rays that would reproduce a scaled radiation source similar to a GRB and to investigate their effect on ISM and IDP materials. This experiment will utilize the existing NIF platform developed for x-ray effects studies, and the dust handling and characterization capabilities developed by IGPP for the Stardust mission.