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Shock Wave Energy Dissipation by Metal-Organic Framework XUAN ZHOU, YURUN MIAO, UIUC, KIETTIPONG BANLUSAN, Purdue U, WILLIAM SHAW, UIUC, ALEJANDRO STRACHAN, Purdue U, KENNETH SUSLICK, DANA DLOTT[1], UIUC — Metal-organic framework (MOF) such as ZIF-8 and UiO-66 show promising shock energy dissipation abilities through mechano-chemical reactions including bond breaking and pore collapse. In this work, we performed quantitative measurements on the shock wave energy attenuated by MOF films using a laser-driven flyer-plate apparatus. Aluminum flyer plates of 75-um thick were accelerated to speeds up to 2.0 km/s by a flat-top pulsed laser to impact the MOF film. The MOF layer was coated on a 200-nm thick gold mirror, which was deposited previously on glass substrate. Photonic Doppler velocimetry (PDV) was used to track the motions of the gold mirror, which can be converted to the energy flux and fluence of the shock wave that transmitted through the MOF layer. We deduced the shock energy that was attenuated by the MOF film by comparing the transmitted energy flux/fluence obtained with and without the presence of the MOF layer. A two-wave-shaped flux-time curve was obtained with the MOF layer because of its nanoporous structure. Studies on the shock wave energy attenuation by ZIF-8 and UiO-66 were carried out under various flyer speeds and sample thicknesses. We used in situ emission spectroscopy to verify that pore collapse was accompanied by chemical bond breakage.

[1]corresponding author:dlott@illinois.edu

Xuan Zhou
Univ of Illinois - Urbana

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