



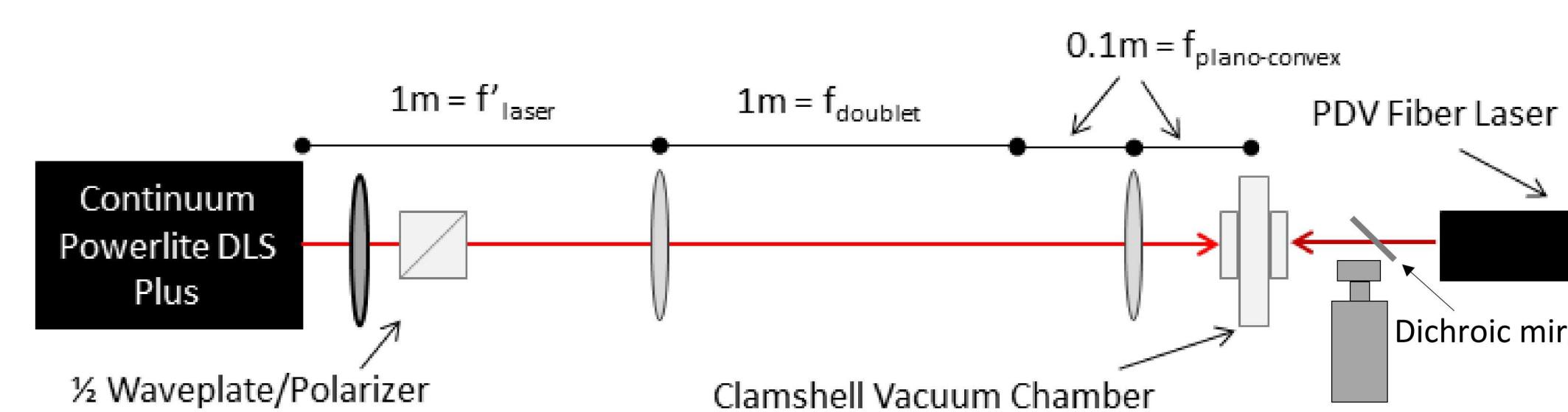
Shock compression initiation of reactive multilayers

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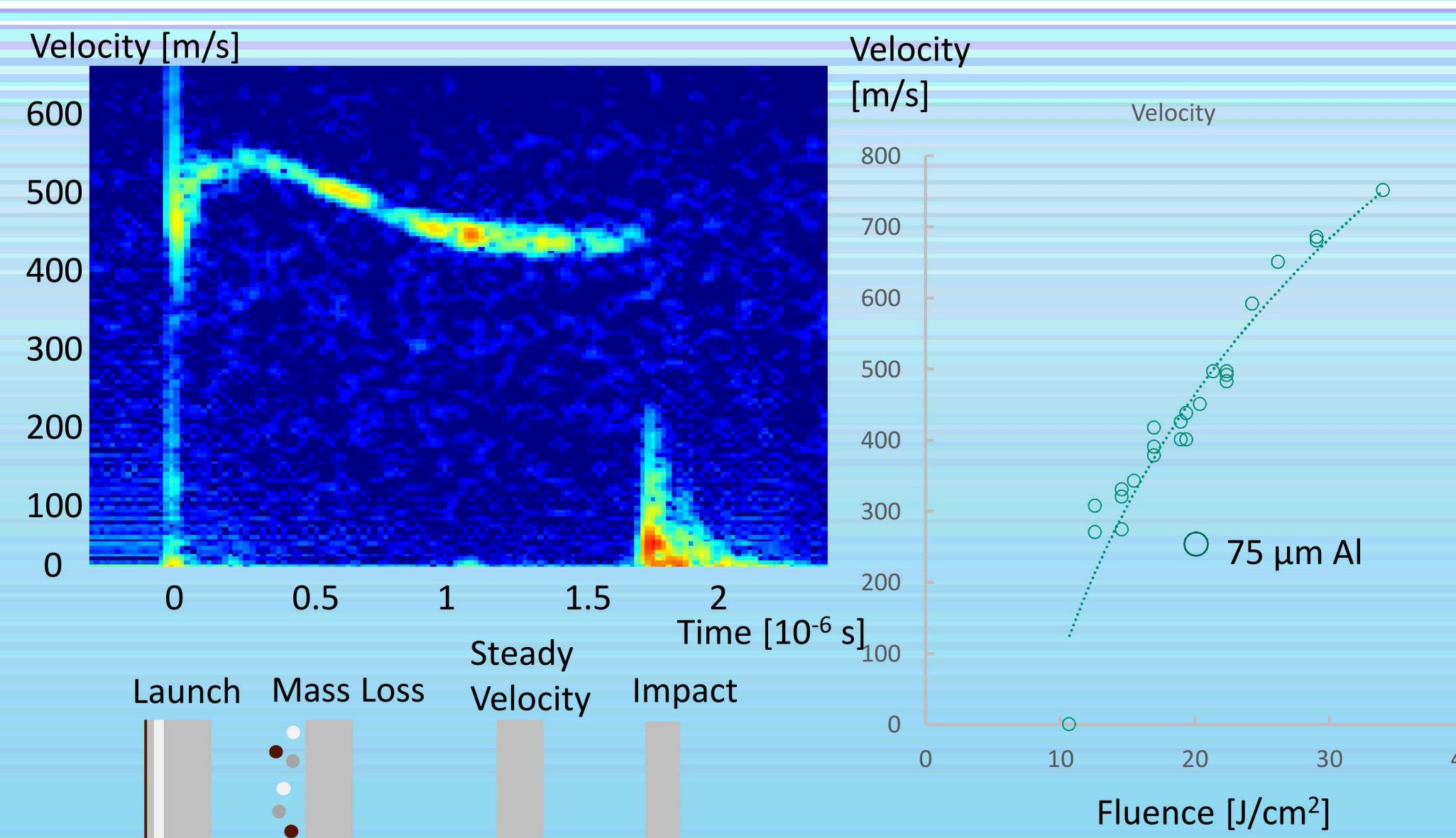
Abstract

The shock-compression response of Ni/Al nanolaminates has been investigated using a laser launched flyer plate system. The alternating layers of constituent materials were deposited onto a masked sapphire substrate via direct current magnetron sputtering such that the cylindrical flyer diameter (1 mm) was larger than that of the impacted film (0.8 mm). An impact velocity threshold was determined, and it was found that increases in flyer velocity lead to faster propagation within the impacted zone. These on substrate experiments were then compared to flyer impact of free standing commercial Ni/Al foils.

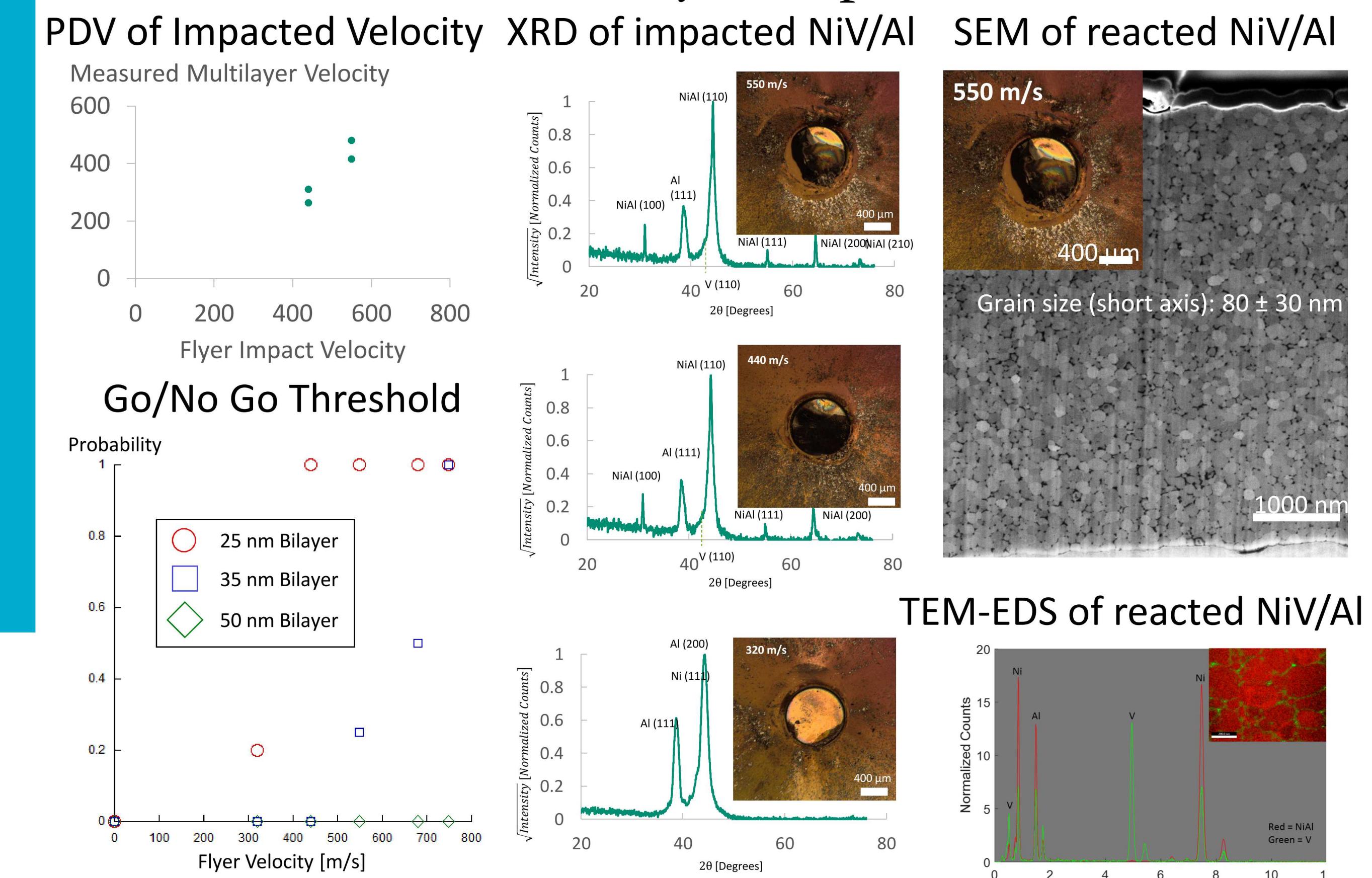
Experimental



Flyer Velocity Calibration

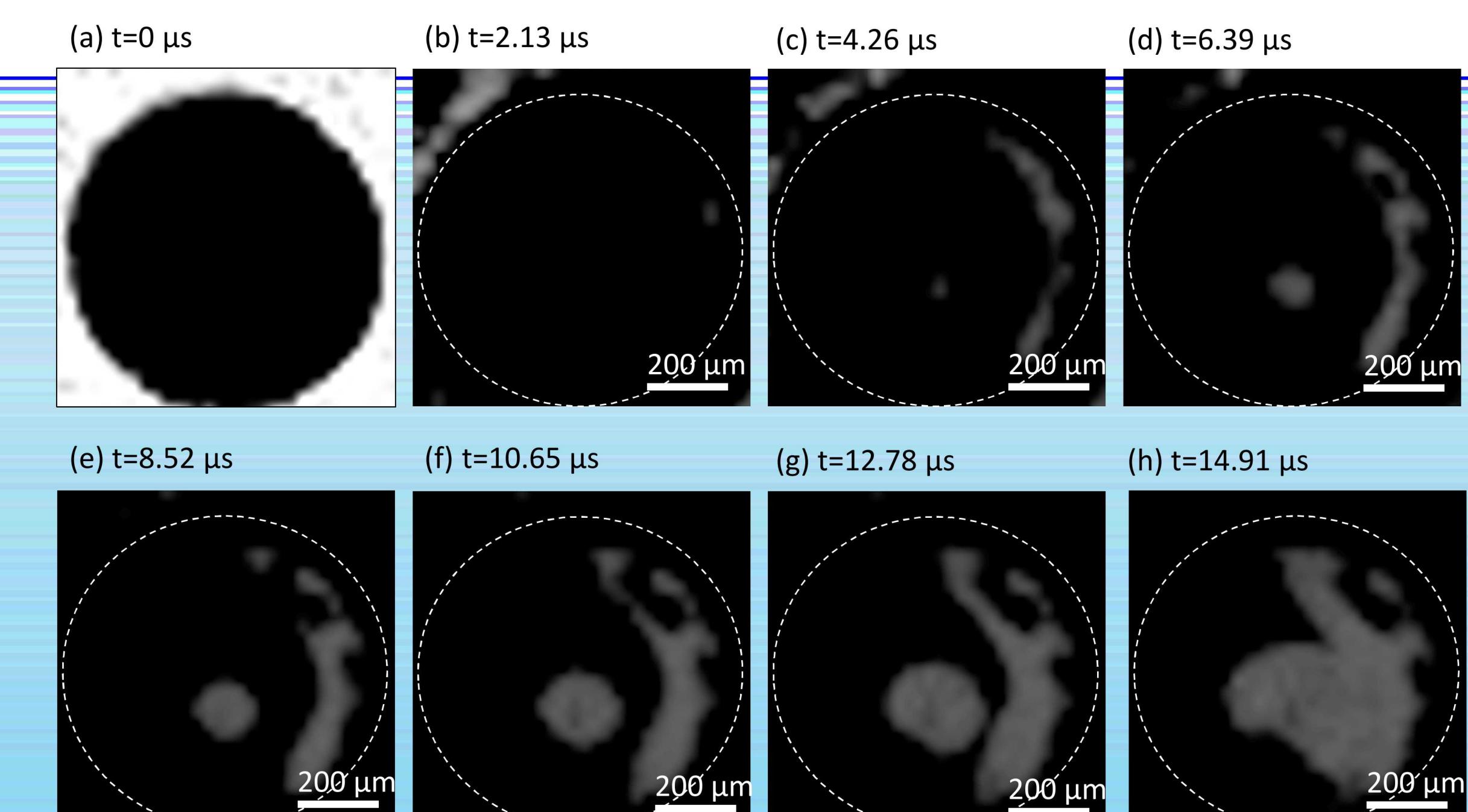


Characterization of Flyer Impacted NiV/Al

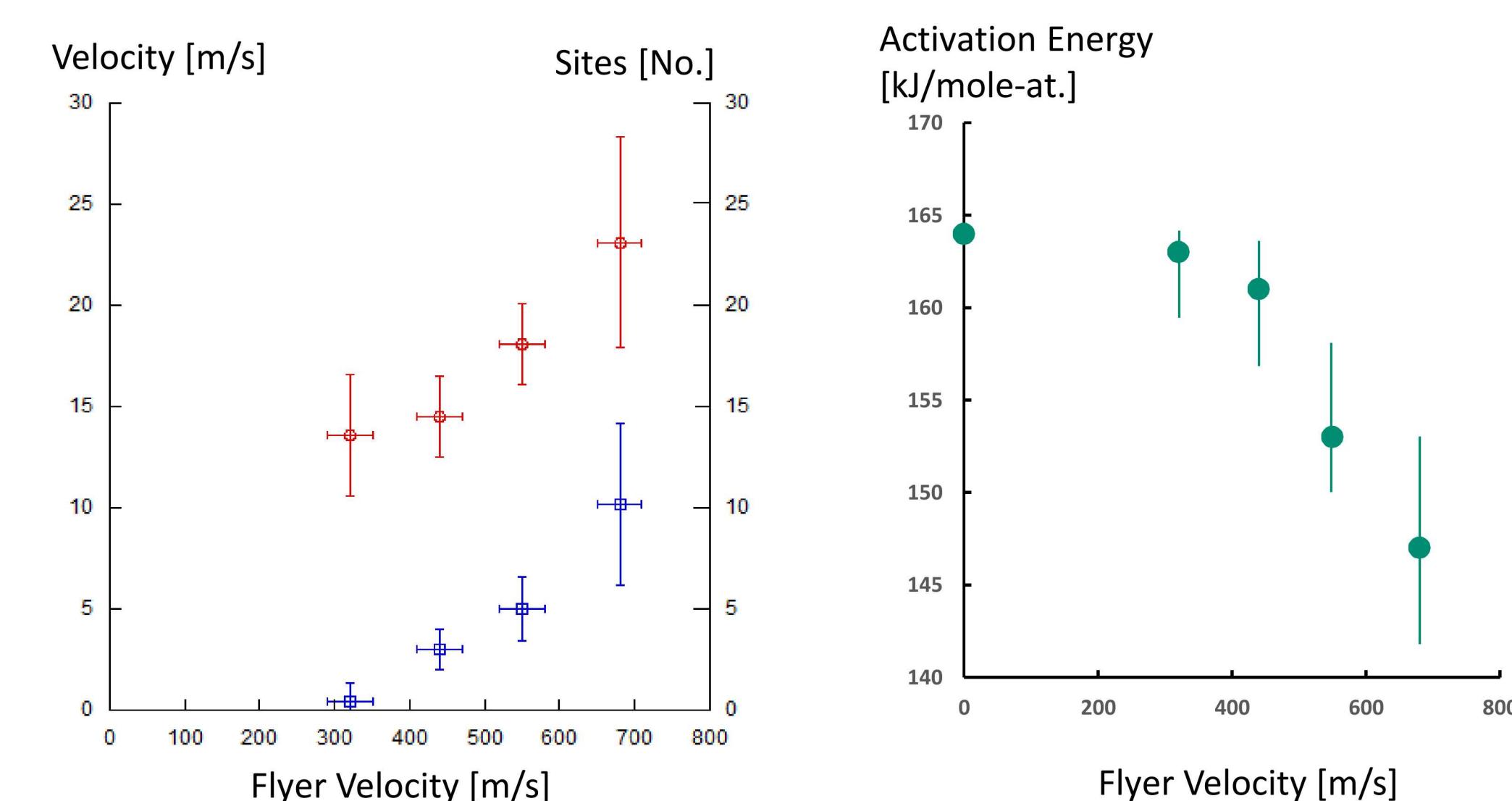


High Speed Videography of Impact

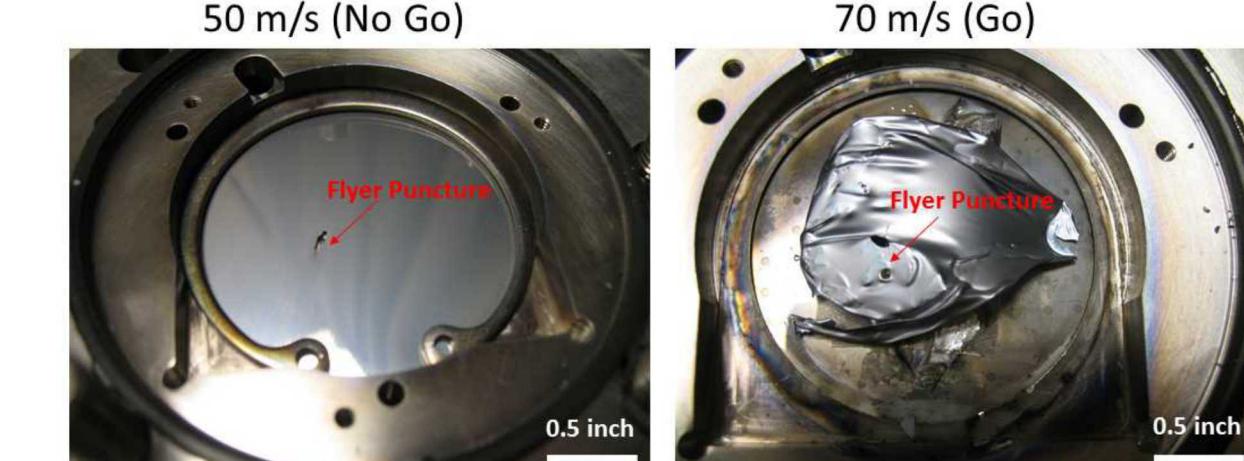
Videography frames of NiV/Al impact at 440 m/s



Reduction in Activation Energy for Impact Induced Reaction



Increased NiV/Al Sensitivity via Shear Impact



Go/no go threshold impact velocity reduces by an order of magnitude when it can pierce the foil compared to dots with smaller diameter than flyers

Take Home Message

Mechanical impact of reactive multilayers can reduce energy barriers to both initiation and propagation of reactions