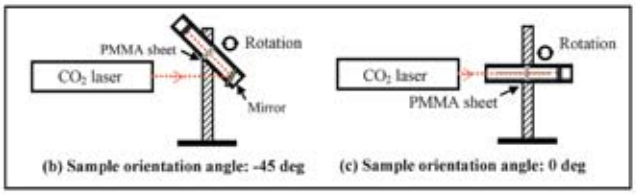
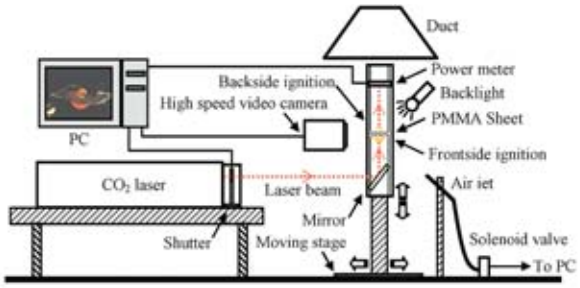
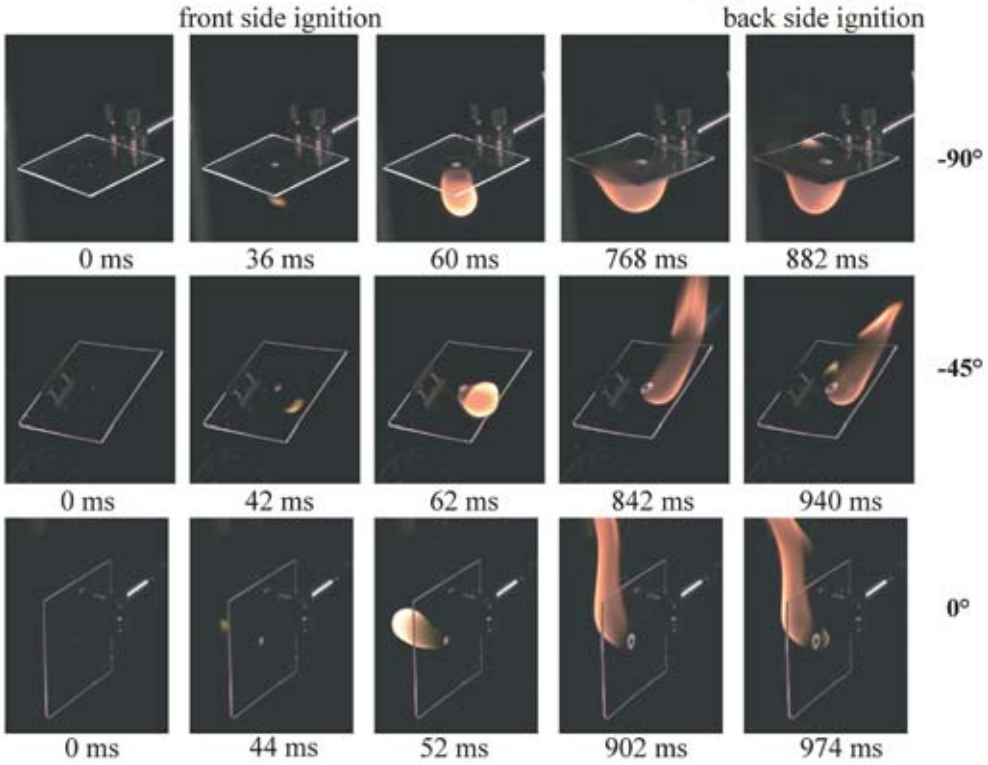




Experimental apparatus



Non-Piloted Ignition Visualization on a Thin Poly(methylmethacrylate) (PMMA) Surface

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Understanding the variation in flame ignition delay time and flame spread on solid materials is necessary to prevent fire hazards. In enclosed room fires, the surface of solid materials is always subjected to radiation from hot combustion products in various directions (e.g., ceiling, wall, and floor). The goal of the present study is to reveal the effect of radiation direction on flame ignition and spread using PMMA as the solid material. The thickness of the PMMA surface was 0.5 mm and ignition was obtained using a CO_2 laser. The phenomena of non-piloted ignition over the irradiated PMMA surface and subsequent ignition over the backside surface was imaged using a Digital High Speed Camera at 500 frames per second with shutter speed set to 50 ms. The camera was fitted with a 60 mm micro lens to obtain the required spatial resolution to capture images of the ignition and flame spread process. Three different orientations of the PMMA sample are shown. The incident laser flux was kept constant and the laser beam diameter was ≈ 4000 μm. In each case, back side ignition was observed after hole formation in the PMMA.