3G07: PILOTED IGNITION DELAY OF PMMA IN SPACE EXPLORATION ATMOSPHERES.
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David Urban, Gary Ruff, NASA John H Glenn Research Center, USA

Comment by Yuji Nakamura, Hokkaido University, Japan
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Since you consider the piloted ignition, the delay time should be controlled by the rate of pyrolysis (gasification) reaction. In this sense, effect of pressure as well as oxygen on the rate (e.g., bubble formation), can be another key factor to modify the delay time.

I would like to add comment that we need so call "standard test method" to evaluate the material to cause fire in low pressure. We have studied the irradiated ignition of thin PMMA sheet in low pressure, but no such trend was observed. This should be because the heating process of gasification fuel to lead ignition is quite different depending on the test method.

Reply by Sara McAllister
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Yes, pressure should affect the rate of oxidative pyrolysis. As the pressure is lowered, these reactions should slow, but from our results, this effect isn't dominate at the pressure tested. It is very possible that this will be a dominant effect at lower pressures than those tested.

Yes, we do need a standard test method to evaluate ignition in low pressure. The ignition of a material will be affected by the test method employed as well as the nature of the sample being tested, e.g. thick or thin, non-charring polymer or charring cellulose, etc.

Comment by Takashi Tsuruda, National Research Institute of Fire and Disaster, Japan
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In this experiment, the sample is heated by radiation. Do you estimate the temperature non-uniformity around the sample and the effect on the boundary flow field?

Reply by Sara McAllister
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No, we do not. It is recognized that the sample holder will heat up to some degree and transfer heat to the air, affecting the boundary layer. We have chosen a sample holder material that does not heat tremendously, hoping to minimize this effect.

Comment by Piotr Wolanski, Warsaw University of Technology, Poland
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Please explain how your results will influence selection of materials for the future American manned spacecrafts? What will be critical power density of ignition source for selected materials?

Reply by Sara McAllister
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The selection criteria for materials onboard future spacecraft will have to be more stringent. It is possible that some of the materials that are currently considered safe will not be in the future. The critical power density for the selected materials will have to be determined by creating that material's flammability diagram and assessing the critical heat flux for ignition of each material separately.