Laboratory simulation of Shooting Stars by using a two-stage light gas gun

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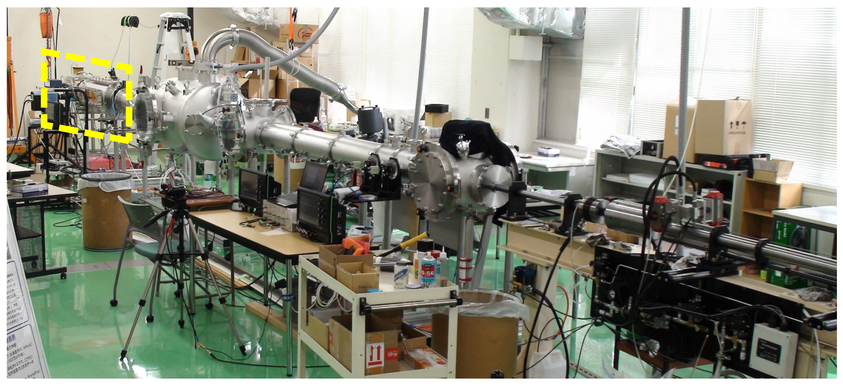
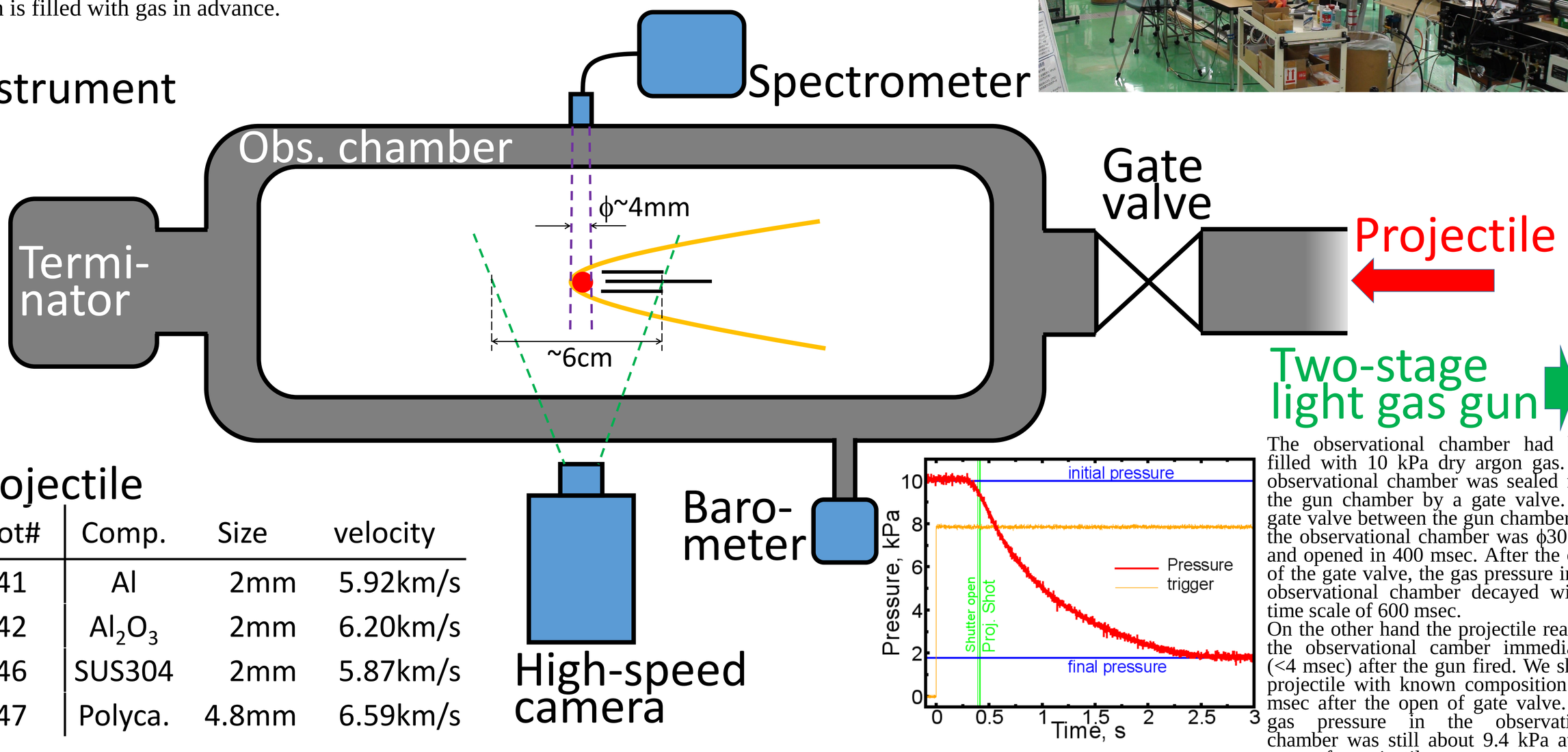
0. Purpose of this study

A shooting star is caused by an entry of a cosmic dust particle into the atmosphere on Earth. We are constructing a laboratory experimental system to simulate shooting stars by using a two-stage light gas gun at Planetary Exploration Research Center, Chiba Institute of Technology. This gun shoot a 4.8 mm sized projectile at the velocity of about 6 km/s. It can also launch smaller (~2 mm) projectile using a nylon-slit sabot. We experimentally simulate a shooting stars by shooting a projectile in to a observational chamber which is filled with gas in advance.



1. Instrument

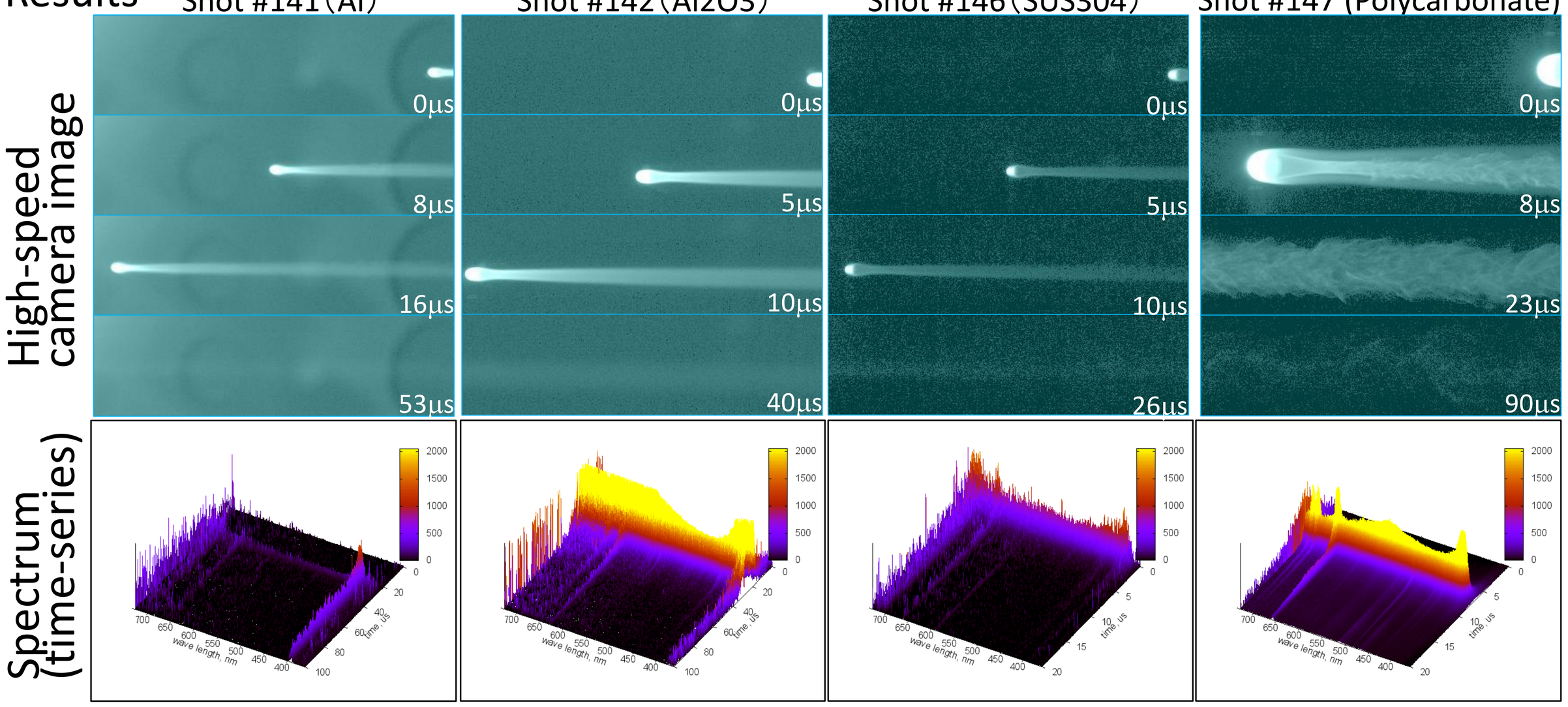


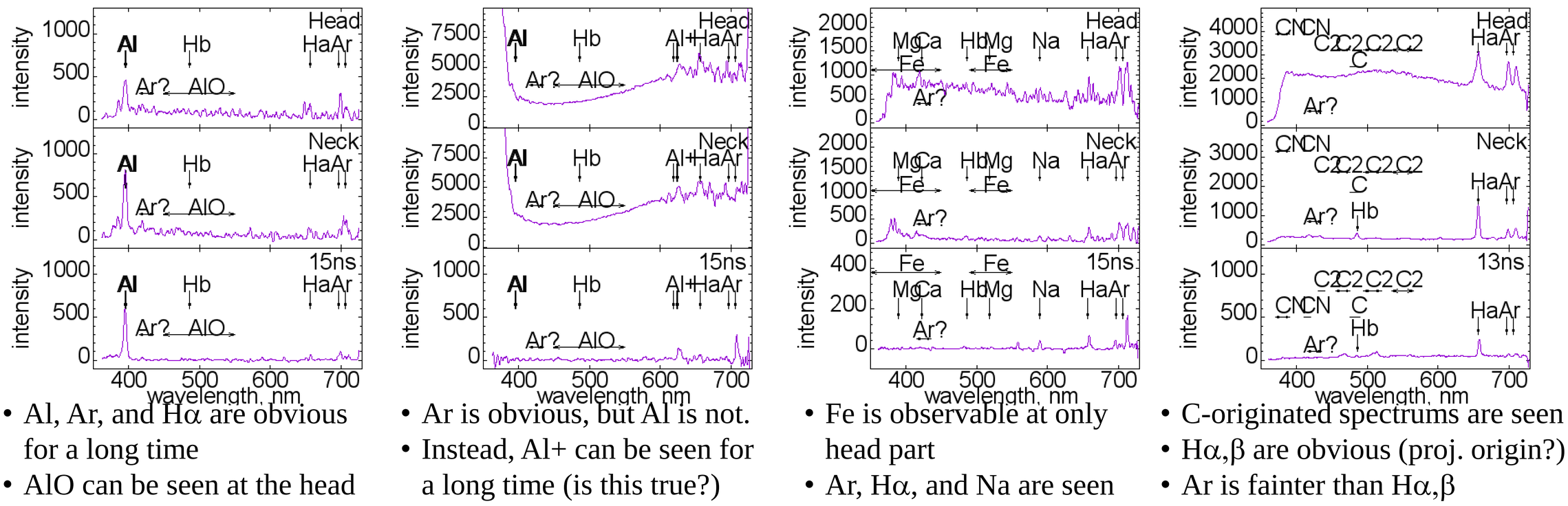
2. Projectile

Shot#	Comp.	Size	velocity
141	Al	2mm	5.92km/s
142	Al_2O_3	2mm	6.20km/s
146	SUS304	2mm	5.87km/s
147	Polyca.	4.8mm	6.59km/s

The observational chamber had been filled with 10 kPa dry argon gas. The observational chamber was sealed from the gun chamber by a gate valve. The gate valve between the gun chamber and the observational chamber was ϕ30 mm and opened in 400 msec. After the open of the gate valve, the gas pressure in the observational chamber decayed with a time scale of 600 msec.
On the other hand the projectile reached the observational camber immediately (<4 msec) after the gun fired. We shot a projectile with known composition 420 msec after the open of gate valve. The gas pressure in the observational chamber was still about 9.4 kPa at the entry of a projectile.

3. Results





Note

- Al, Ar, and Hα are obvious for a long time
- AlO can be seen at the head
- Ar is obvious, but Al is not.
- Instead, Al+ can be seen for a long time (is this true?)
- Fe is observable at only head part
- Ar, Hα, and Na are seen
- C-originated spectrums are seen
- Hα,β are obvious (proj. origin?)
- Ar is fainter than Hα,β