ON LINE DIAGNOSTICS

LASER LIGHT SCATTERING
($\lambda = 514 \text{ nm}$) at three different angles:
$20^\circ$, $90^\circ$ and $160^\circ$

HYBRID BURNER NOT SUITABLE FOR LLS

✓ determination of the starting aggregation zone
SILICA Characterization

XRD $\Rightarrow$ amorphous structure

FTIR

ON LINE DIAGNOSTICS

Laser Induced Incandescence (LII)
LII resulted a powerful technique in soot diagnostics

LII Basic principles
- A rather strong laser power is sent on the particles by a pulsed laser
- Particles are overheated then emit a radiation.

HOW TO DISTINGUISH THIS RADIATION?
Intensity, spatial origin, time evolution
- The LII signal basically is determined, for a given substance:
  1. in INTENSITY by the matter concentration inside the probe volume (material volume fraction)
  2. in DECAY TIME by the **primary particle size** (still debated models)
Soot is black and absorbs all wavelengths. Other materials have different features.

Soot withstands high laser fluences, still emitting only a blackbody radiation. This could be not the same for other material (R. Vander Wal, Appl. Opt. 1999).

ON LINE DIAGNOSTICS

Laser Induced Incandescence (LII)

FROM SOOT TO OTHER MATERIALS
Laser Induced Incandescence (LII)

3. OUR APPLICATIONS ON TITANIA
ON LINE DIAGNOSTICS: LII

Nd YAG laser at:
1064nm
532nm
266 nm

The outcoming signal analysed:
✓ at a fixed (but variable) time as a function of wavelength (LIE)
✓ at a fixed wavelength as a function of time

Fluence at the probe volume:
625 mJ/cm²
60 mJ/cm²
21.74 mJ/cm²
The gateable intensifier of the multichannel detector

- open synchronous with the laser pulse (PROMPT SIGNAL)
- open with a finely tunable delay (DELAYED SIGNAL)
the spectrum of the luminous pulse originated by the overheating caused by the laser (synchronous or delayed)
This offers, in principle, a signal sensitive to the particle size. At least a qualitative on-line monitoring is than possible.
NEXT STEPS @ CNR in Italy

1. LII experiments on TiO$_2$ flame and on SiO$_2$ flame in the Hybrid burner

Why a period at PTL?

2. Coannular diffusion burner will be set to work; LII on the diffusion flame by the coannular burner

3. Implementation of a massive collection tool

4. DLS analysis of powder suspensions (we already have the N5-Beckman Coulter instrument)

5. Set up of FSP and possibly LLS on the FSP