

Flash measurements

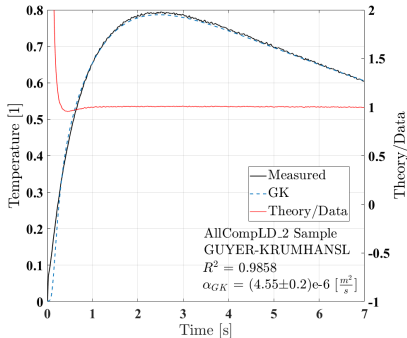
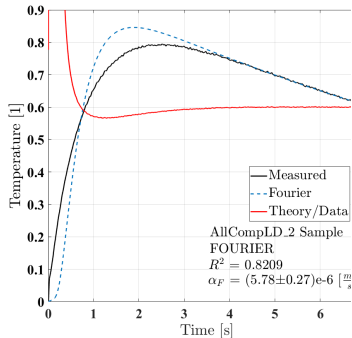
Goal: measure the thermal diffusivity of the carbon foams

Technique:

- Excite one side of the sample with a short (0.01 s) heat pulse
- Measure the temperature history on the other side

Results:

- The ERG sample follows the Fourier thermal conduction rule \Rightarrow the fit can be used to measure the thermal diffusivity
- The AllCompLD differs from Fourier fit \Rightarrow not suitable to investigate the thermal diffusivity
- The GK constitutive equation fits well to AllCompLD measurements \Rightarrow investigate the thermal diffusivity and the additional parameters of the GK model.



The measured thermal diffusivity

EGR samples:

| Sample ID | α_F $10^{-7} \text{ [m}^2/\text{s]}$ |
|-----------|--|
| ERG.1 | 6.06 ± 0.12 |
| ERG.2 | 7.45 ± 0.19 |
| ERG.3 | 7.37 ± 0.54 |

AllCompLD samples:

| Sample ID | α_F $10^{-6} \text{ [m}^2/\text{s]}$ | α_{GK} $10^{-6} \text{ [m}^2/\text{s]}$ |
|-----------|--|---|
| AllComp_1 | 8.25 ± 0.74 | 6.9 ± 0.45 |
| AllComp_2 | 5.78 ± 0.27 | 4.55 ± 0.2 |

Conclusions and questions:

- The reproducibility for one sample is good, as the errors mentions in the table.
- The reproducibility from sample to sample is not better than 50 %. We expect that it comes from the different inner structure. Do you experience the same effect in CERN during measurements?
- Which method did you use in CERN to measure the thermal conductivity? Do you measure the heat capacity of the samples in CERN? \Rightarrow It would be good to compare the measured properties with two different methods.
- Is the last samples we got from the CERN known to be orthotropic? If yes, where they cut in different directions for the two separated packs we get?

Future plane:

- Estimate under which conditions gives the Fourier theory (implemented in Ansys) gives a good approximation for GK theory (was found to describe the measurements well).