

Data Interpretation 2: PMMA

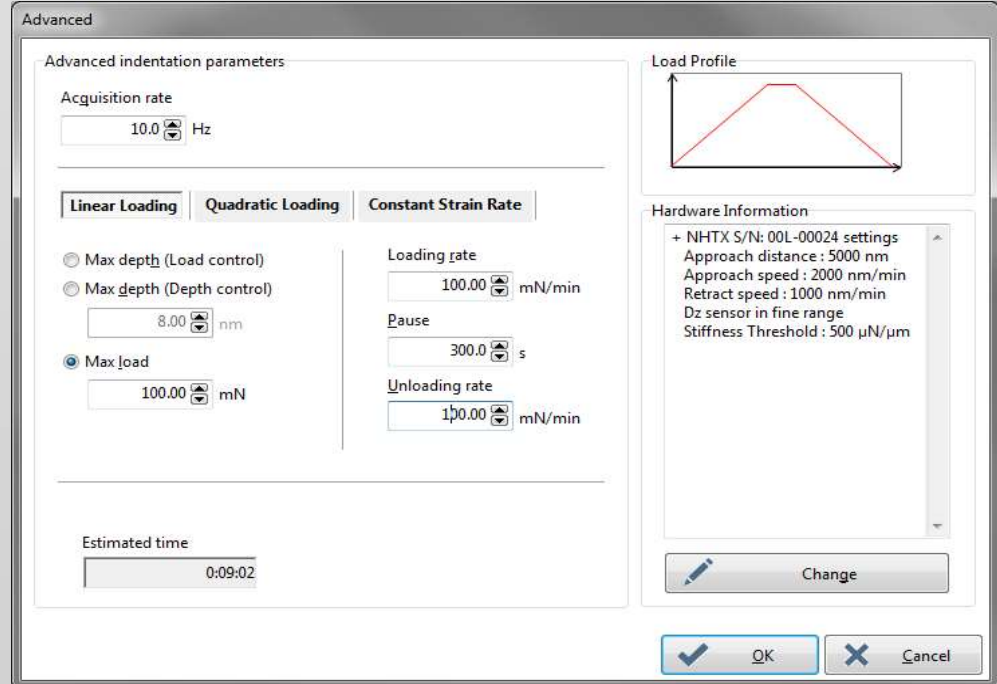
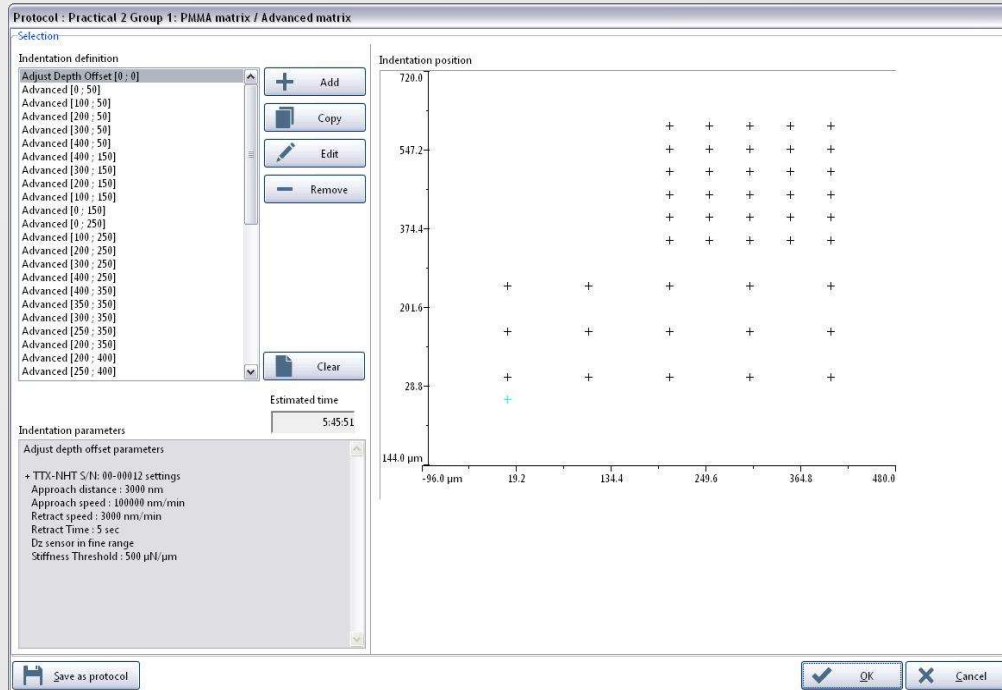
Nick Randall

PMMA Creep

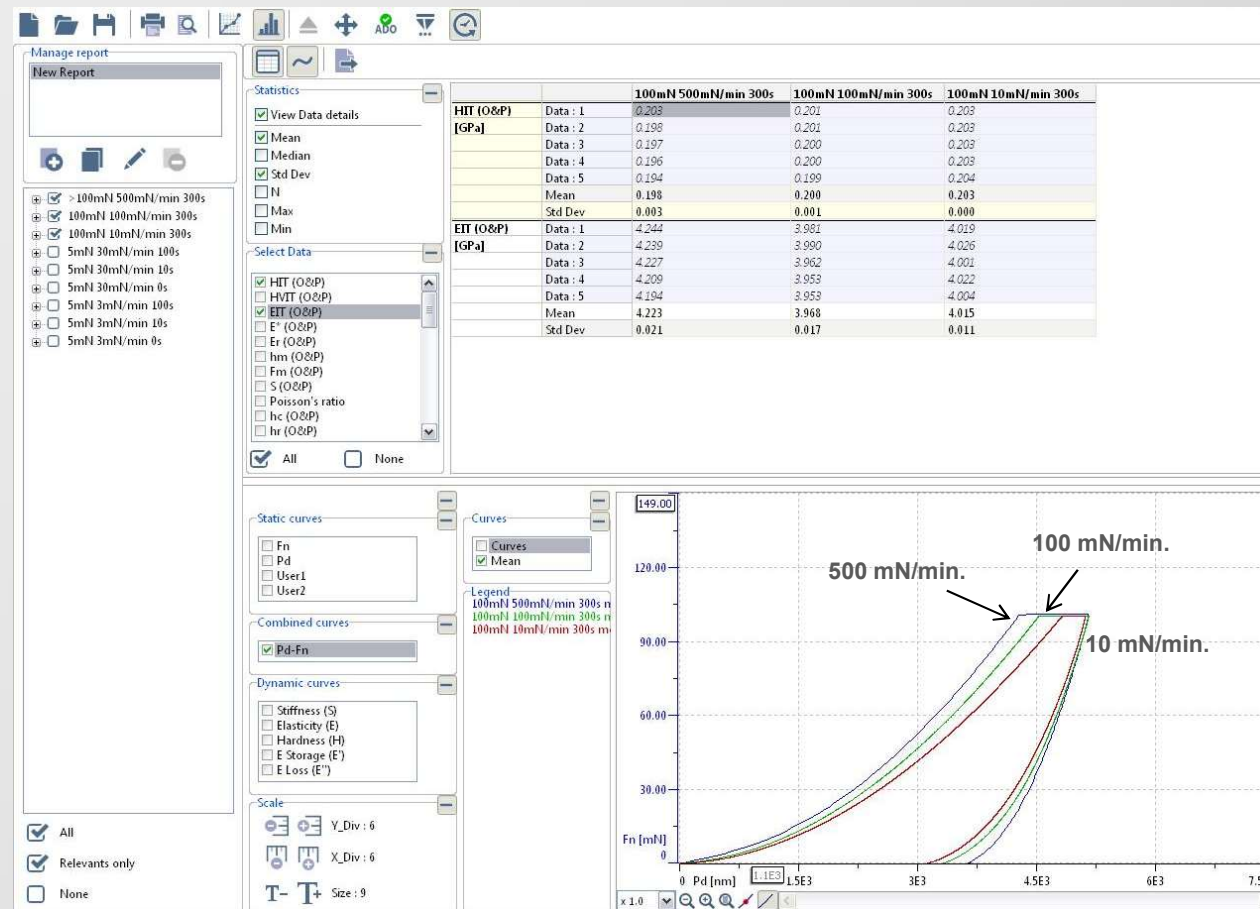


Poly Methyl Methacrylate (PMMA) is a transparent thermoplastic with a glass transition temperature (T_g) ranging from 85 to 165°C, depending on composition. It usually shows linear viscoelastic behavior at low stress levels and nonlinear viscoelastic behavior at higher stress levels.

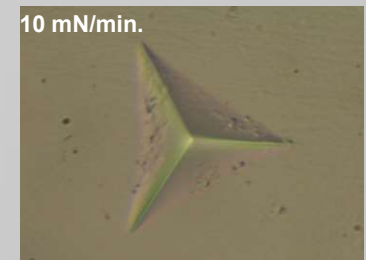
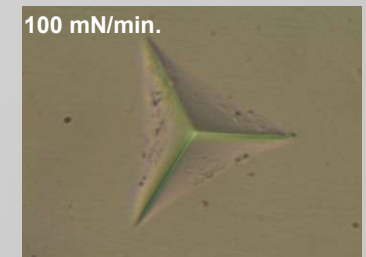
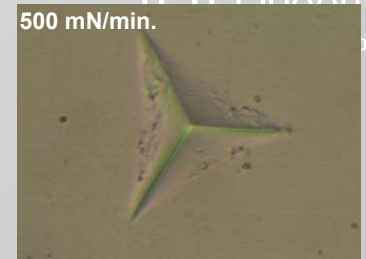
PMMA matrix



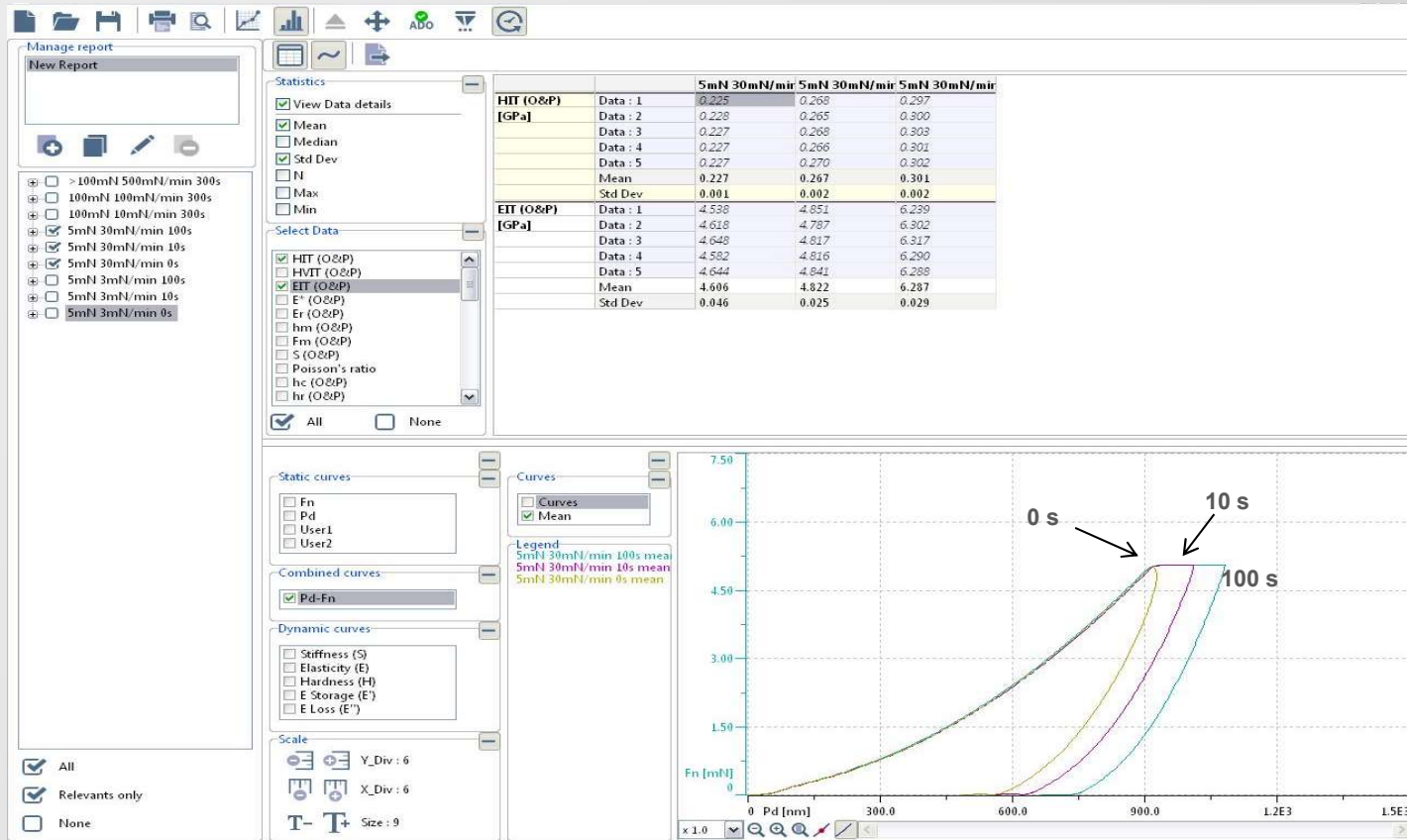
PMMA matrix: 100 mN



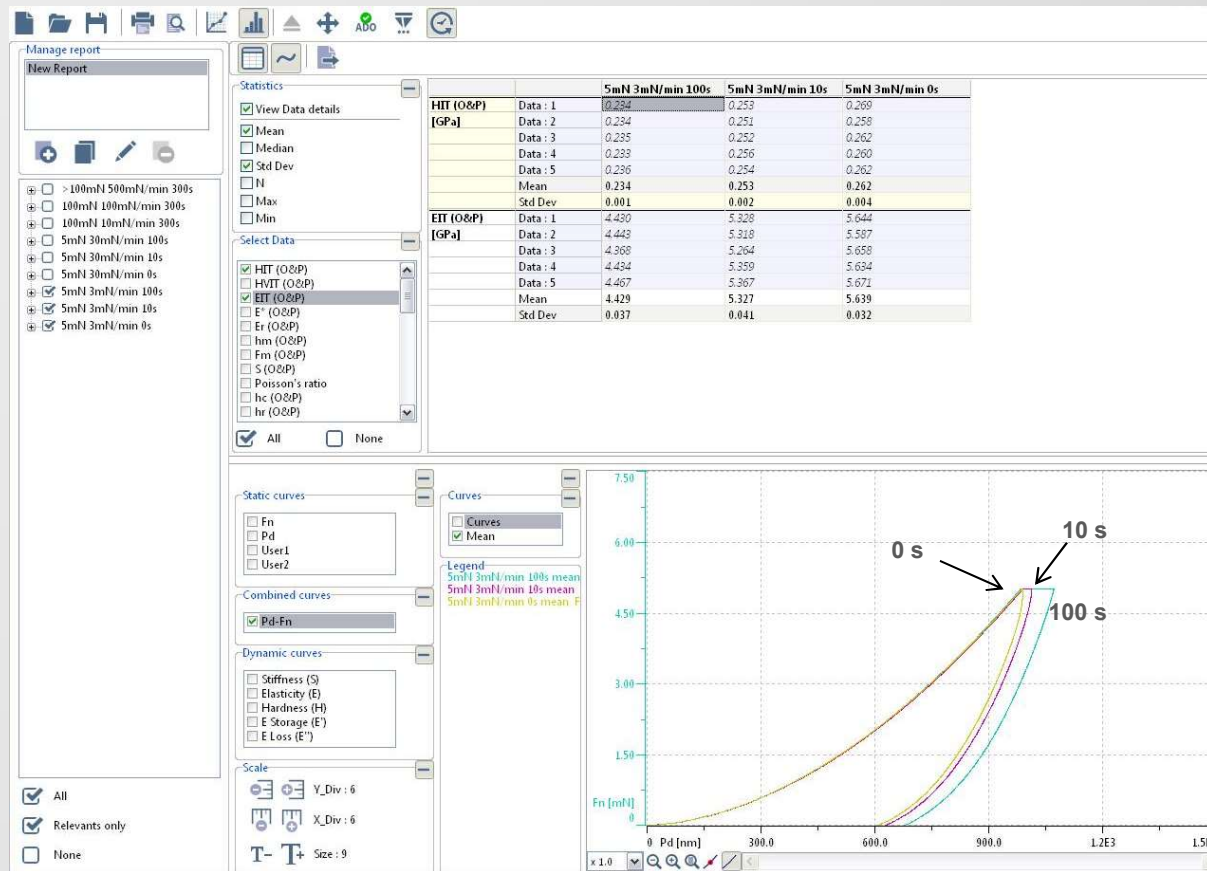
Queen Mary
London



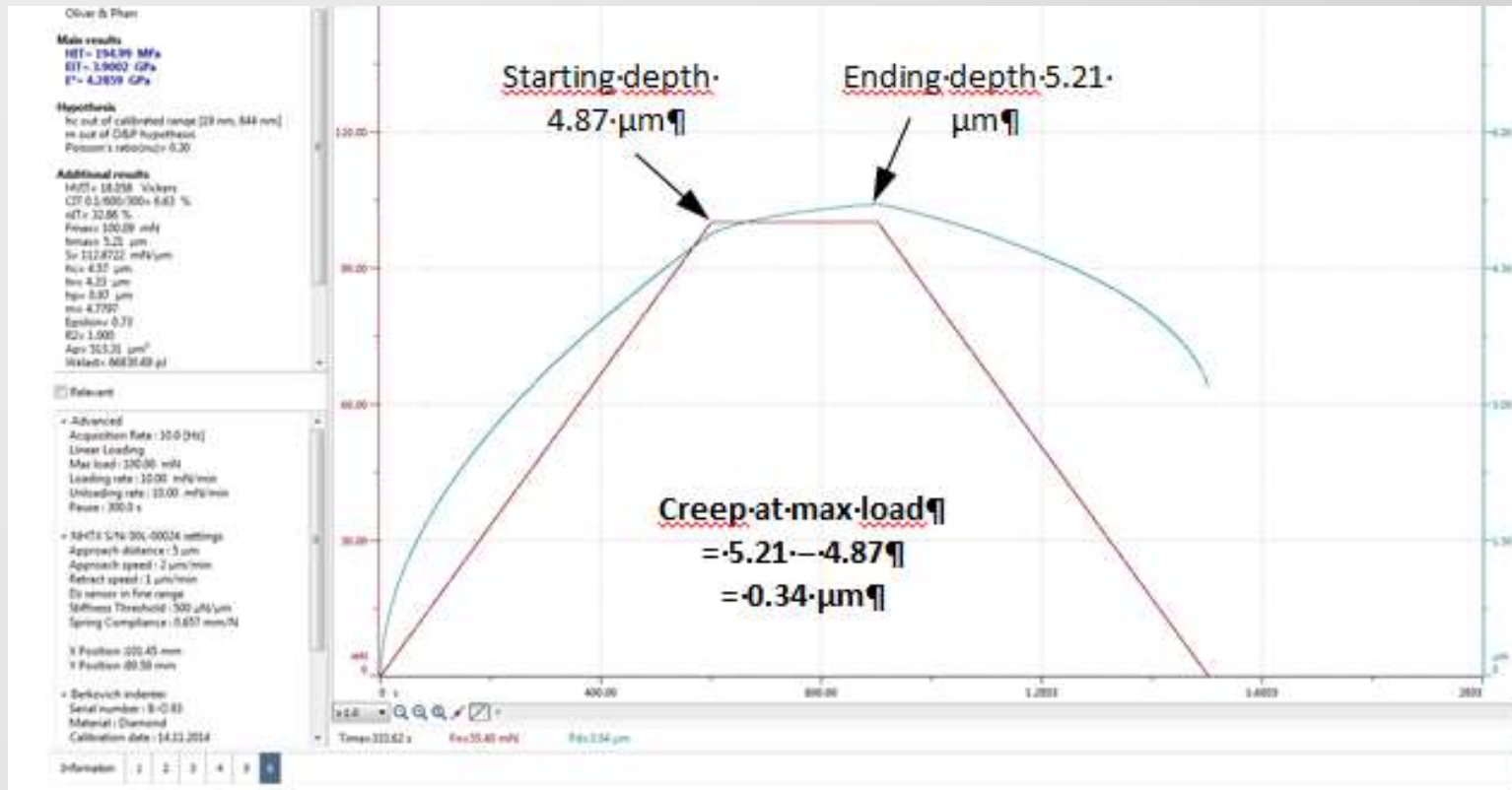
PMMA matrix: 5 mN, 30 mN/min.



PMMA matrix: 5 mN, 3 mN/min.



PMMA matrix: creep



PMMA matrix: creep

The Creep, C_{IT} , value is calculated automatically by the software. It is defined as follows:

$$CIT = \frac{h_2 - h_1}{h_1} \cdot 100$$

where:

h_1 is the indentation depth at time t_1 of reaching load F (which is kept constant)

h_2 is the indentation depth at time t_2 of holding the constant load, F .

Indent Number	Loading Rate (mN/min.)	Measured Creep at max. load (nm)	Hardness, HIT (MPa)	Elastic Modulus, EIT (GPa)	Creep, CIT (%)
1	500	889	198	4.223	20.35
2	100	629	200	3.968	13.82
3	10	292	203	4.015	6.09

PMMA Strain Rate Sensitivity

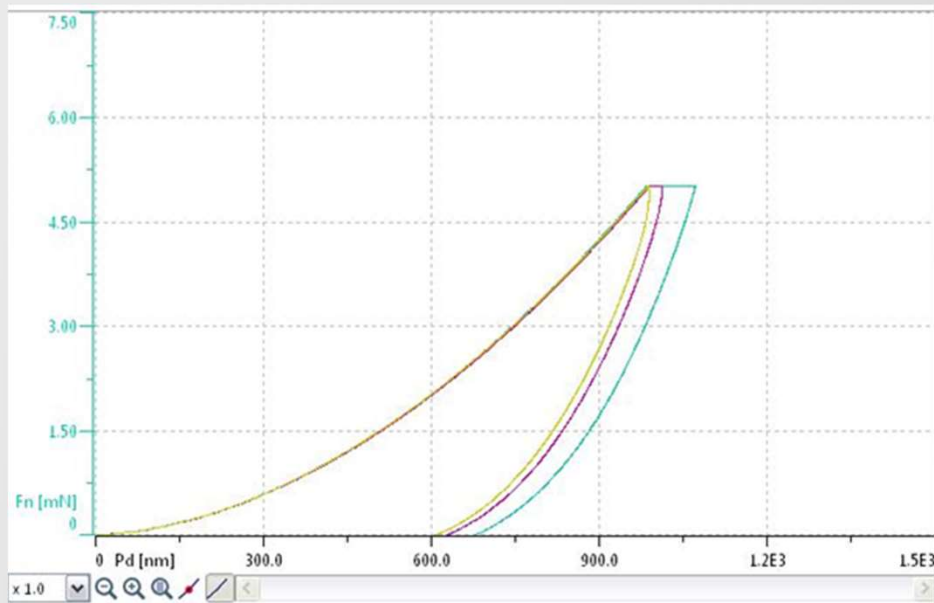


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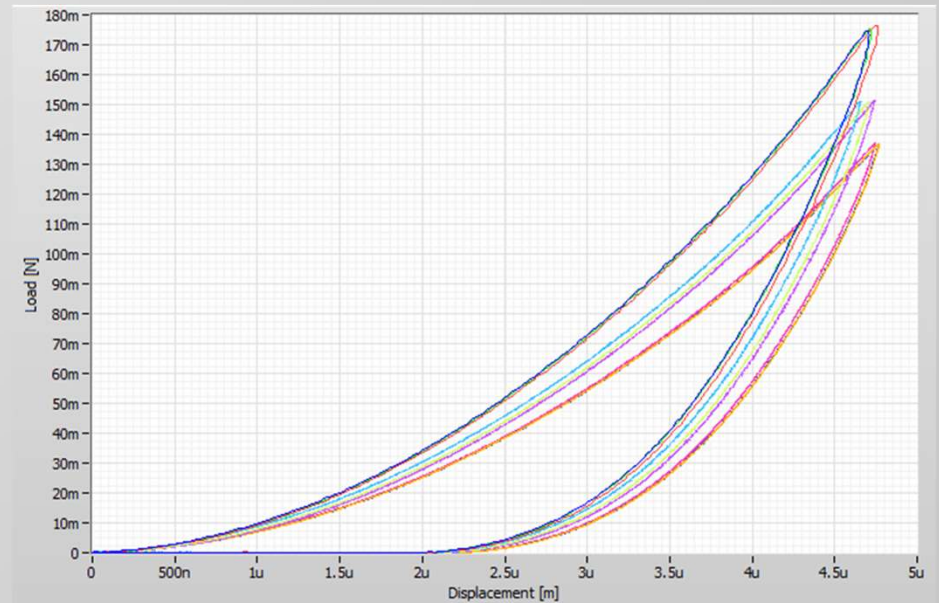
PMMA Strain Rate Sensitivity

How does displacement vs. load control influence the curves..?

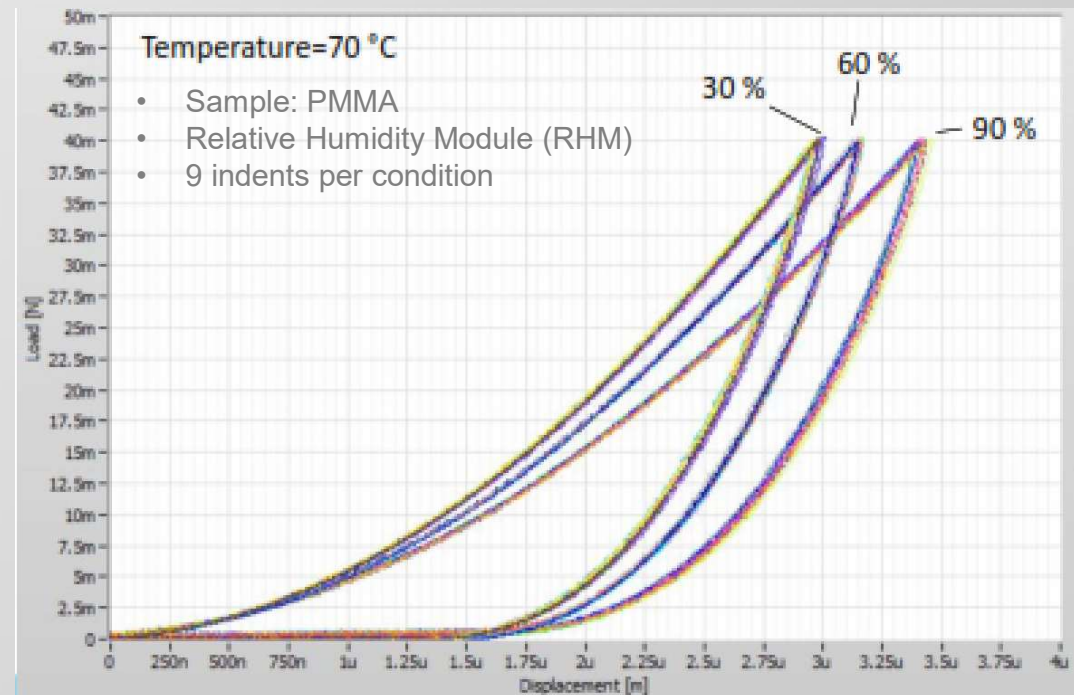
LOAD CONTROL



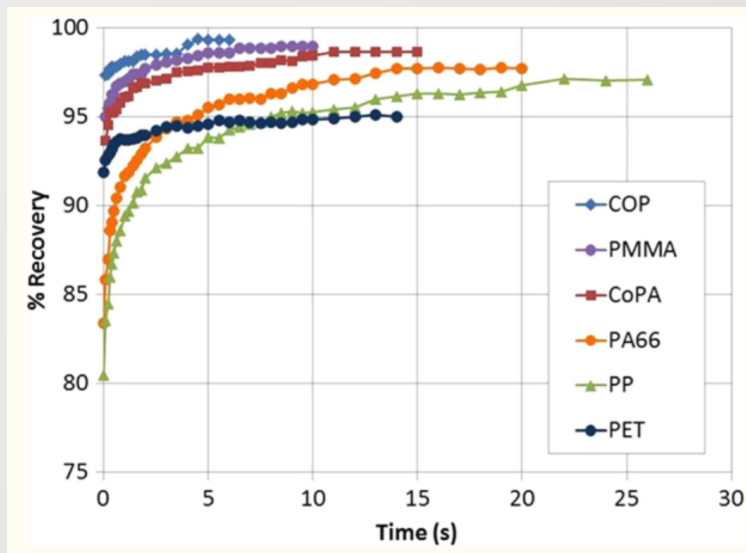
DISPLACEMENT CONTROL



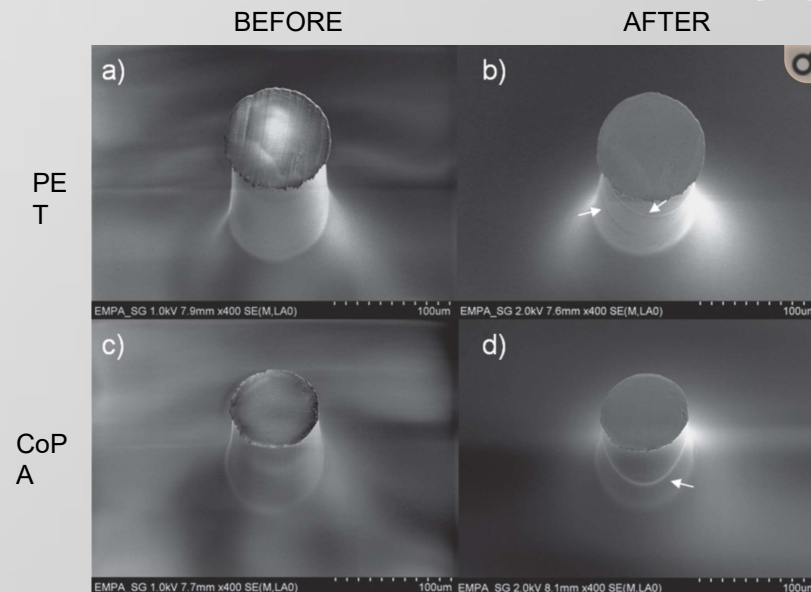
PMMA Relative Humidity Sensitivity



PMMA compression of melt-spun single fibres



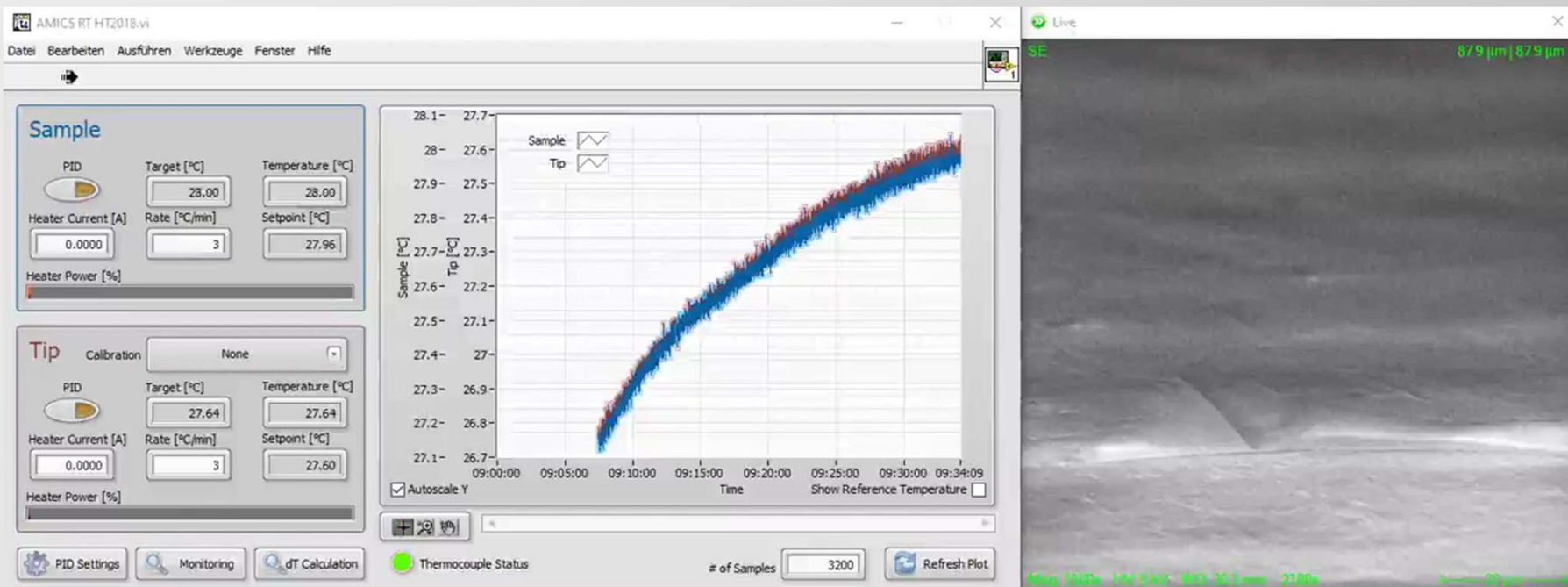
Bending recovery behavior for different melt-spun filaments.
Each data point is average of 3 measurements



A. A. Leal, G. Mohanty, F. A. Reifler, J. Michler, R. Hufenus, Mechanical response of melt-spun amorphous filaments, *Sci. Technol. Adv. Mater.* 15 (3) (2014) DOI: 10.1088/1468-6996/15/3/035016

PMMA viscoelastic recovery

Recovery effect in epoxy resin with increasing temperature:



(Courtesy of Université Libre de Bruxelles)

Recovery of the indent depth 27 - 65 °C

PMMA Strain Rate Sensitivity

