Investigation of Dynamic Mechanical Properties of PETG Thermoplastic

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PETG plastic

Table 1. Mechanical properties of PETG plastic

Parameter	Unit	Value
Young's Modulus	MPa	2950.0
Poisson's Ratio	-	0.4
Bulk Modulus	MPa	4868.0
Shear Modulus	MPa	1054.3
Isotropic Secant Coefficient of Thermal Expansion	1/°C	$4.3 \cdot 10^{-5}$
Tensile Ultimate Strength	MPa	67.380
Tensile Yield Strength	MPa	58.680

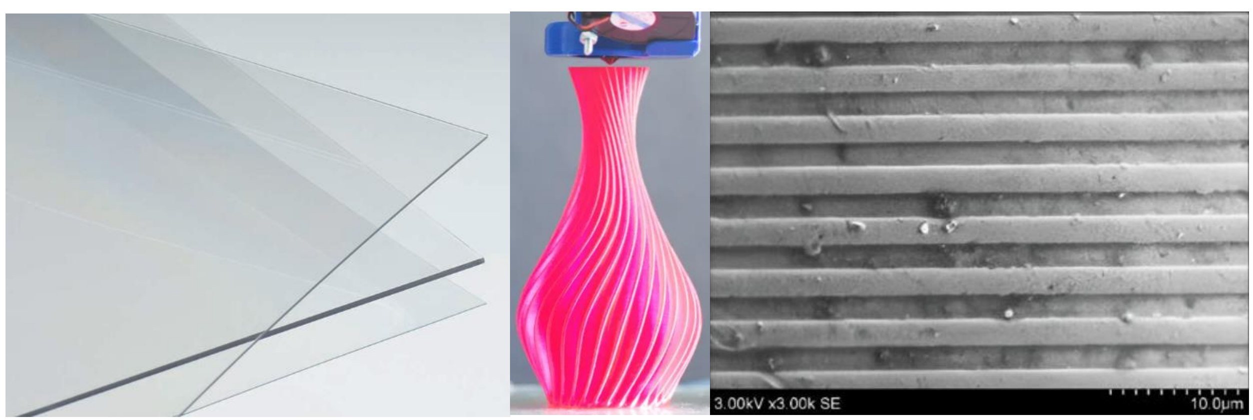


Fig. 1 PETG plastic sheet and PETG plastic used in 3D printing technologies and microstructure formation

Experimental equipment

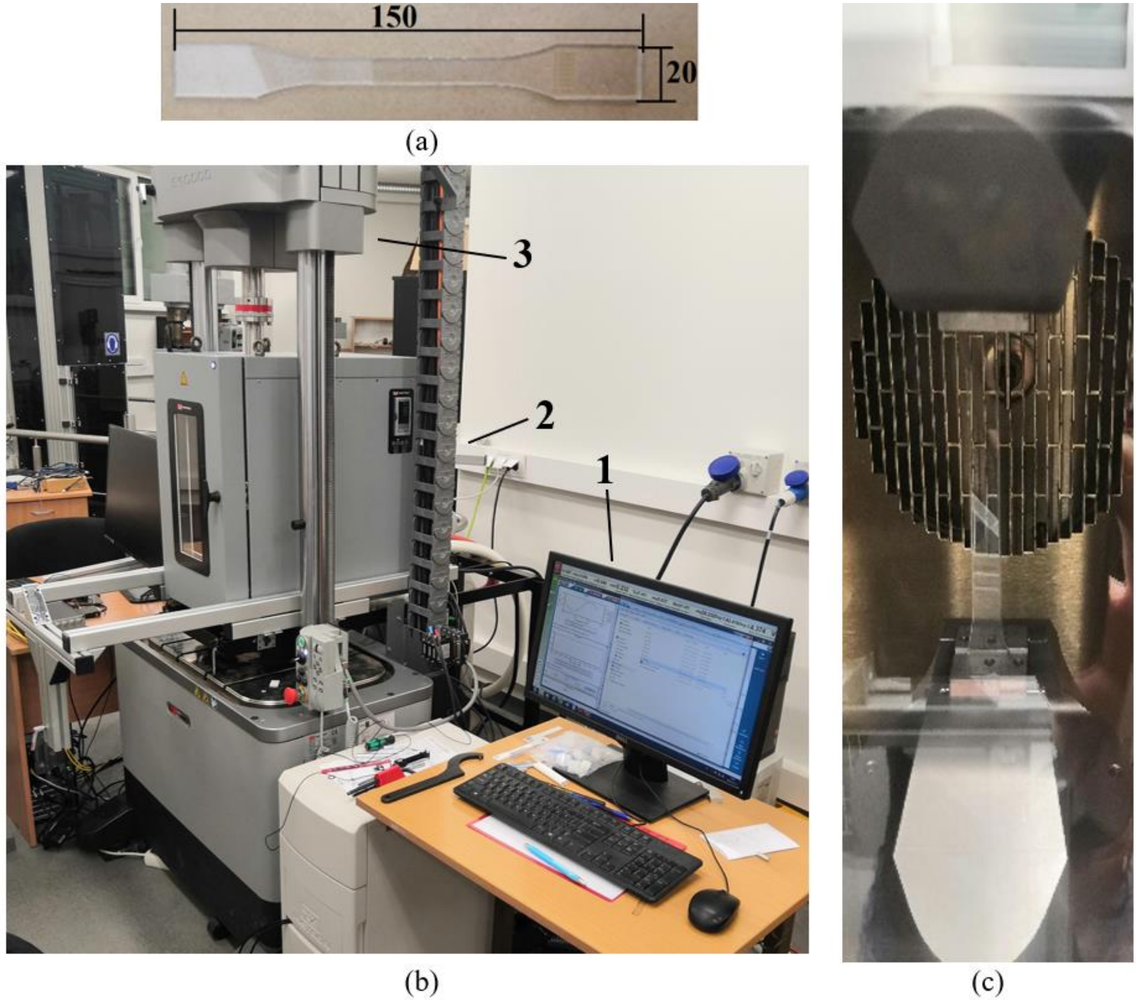


Fig. 2 Experimental equipment and specimens: (a) Dog bone sample with general dimensions; (b) Tensile testing machine with control computer: 1 - control computer, 2 - heating chamber, 3 – tensile machine drive; (c) Dog bone specimen in the chamber of the tensile testing machine

Phase calculation schedule

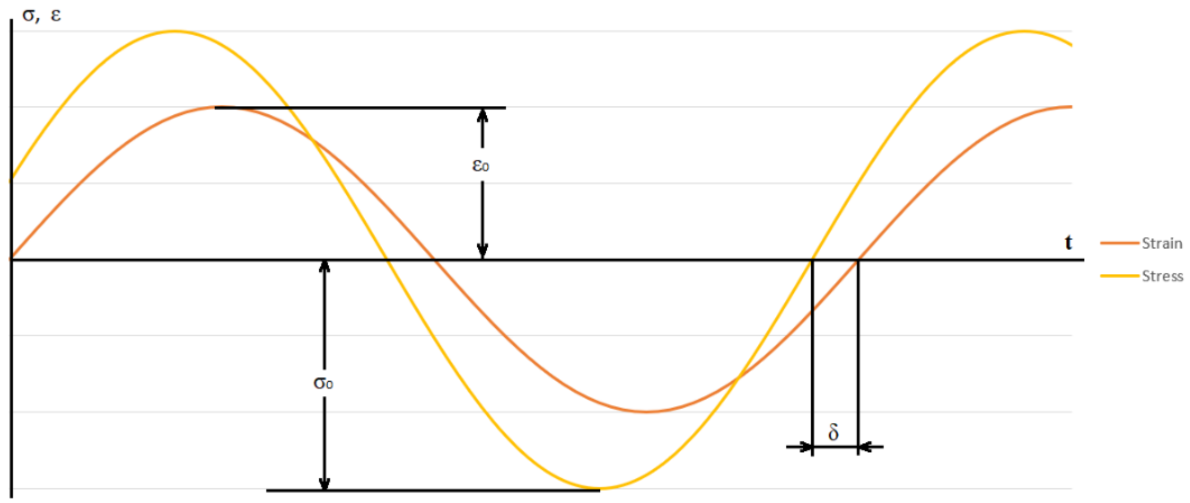
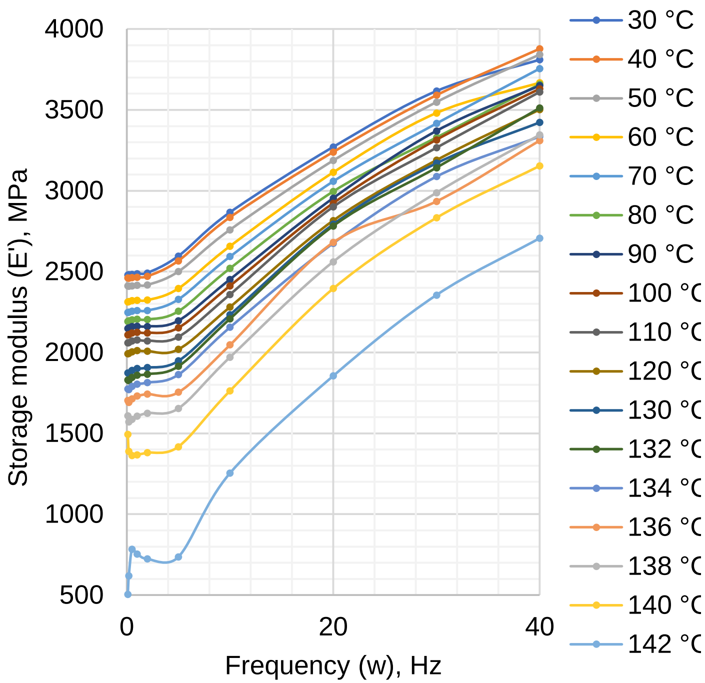


Fig. 3 Phase calculation schedule, where ε is strain, σ is stress and δ is phase

PETG plastic storage modulus



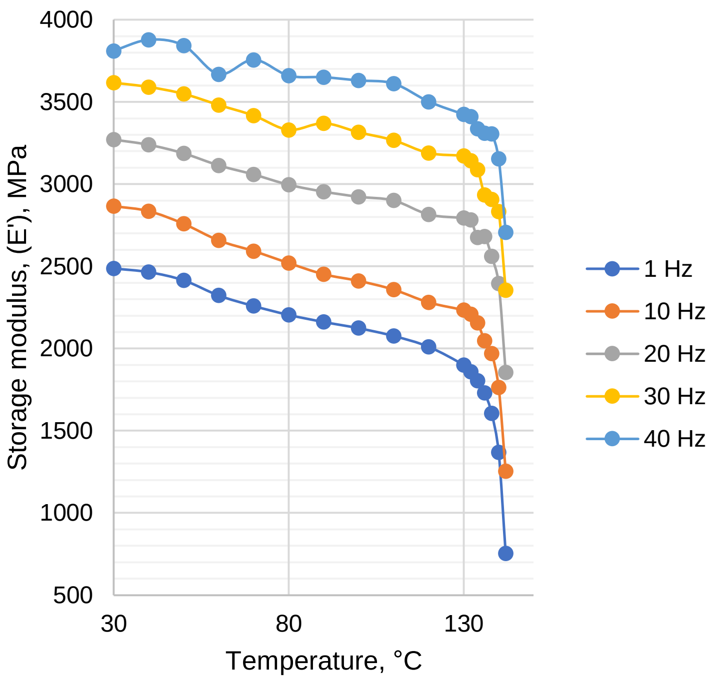
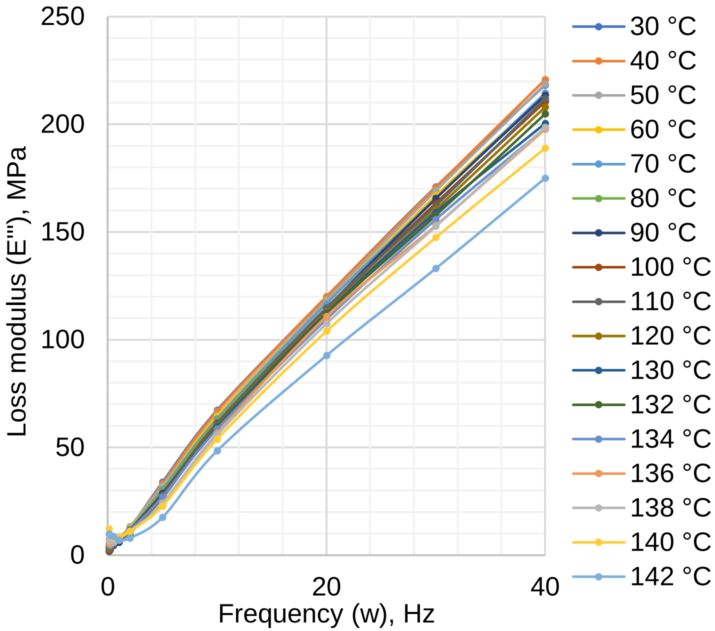


Fig. 4 The storage module obtained by experimental

PETG plastic loss modulus



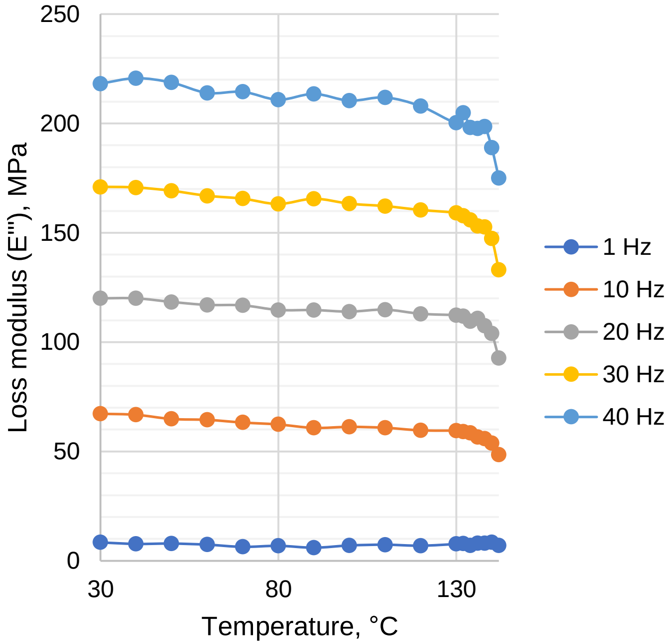


Fig. 5 The loss module obtained by experimental

Conclusions

Due to the increased need to design micro- and macrosystems of varying complexity, DMA analysis has become even more important. Using DMA analysis, the behaviour of plastics can be determined much more precisely. Thus, the dynamic properties of PETG thermoplastic were analysed using DMA analysis. The data were analysed up to a maximum frequency of 40 Hz. As the plastic temperature increased, the storage and loss modulus values decreased, but as the dynamic excitation frequency increased, the modulus values increased. If necessary, the value of the storage and loss modulus could be recalculated and extended to a wider range of dynamic excitation frequency.

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Thank you for your attention

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