

# Identification of material property: Hardness (50), Damping (Small)

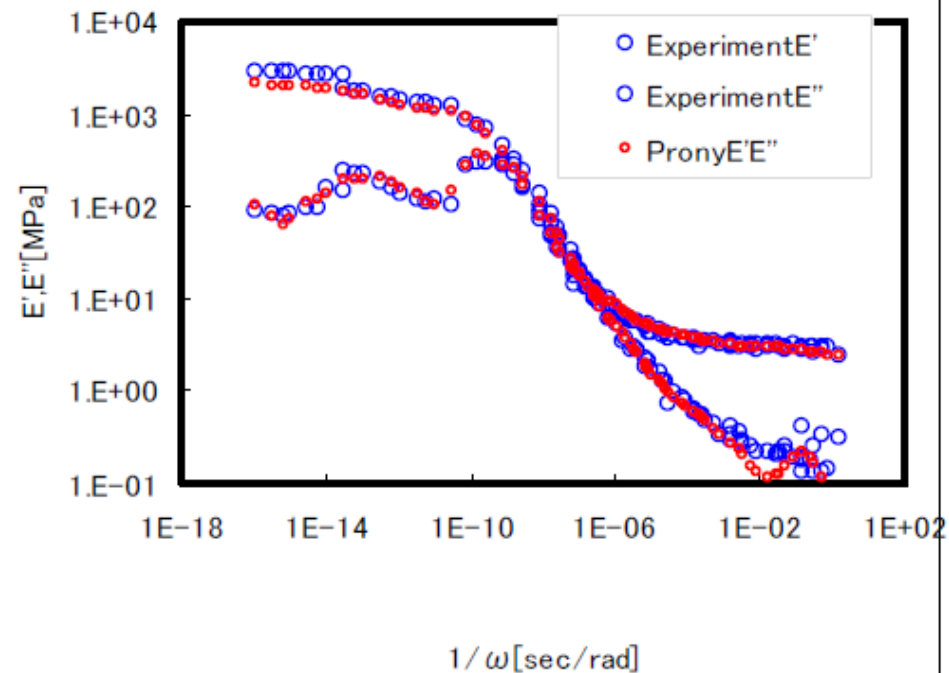
ANSYS 10.0

Young's Modulus[MPa]	Poisson's Ratio[-]
2.16876E+03	4.99000E-01
$\bar{g}_i^P$ [MPa]	$\tau_i^G$ [sec]
8.86487E-02	1.06103E-16
6.33728E-02	3.18310E-15
1.31797E-01	3.18310E-14
1.48944E-01	3.18310E-13
7.76324E-02	3.18310E-12
1.70599E-12	3.18310E-11
2.85856E-01	1.59155E-10
1.70447E-01	1.59155E-09
2.44160E-02	1.59155E-08
4.57681E-03	1.59155E-07
1.88173E-03	1.59155E-06
5.59301E-04	1.59155E-05
3.51830E-04	0.000159155
1.58752E-04	0.001591549
3.10742E-05	0.015915494
1.87728E-04	0.159154941

Prony series

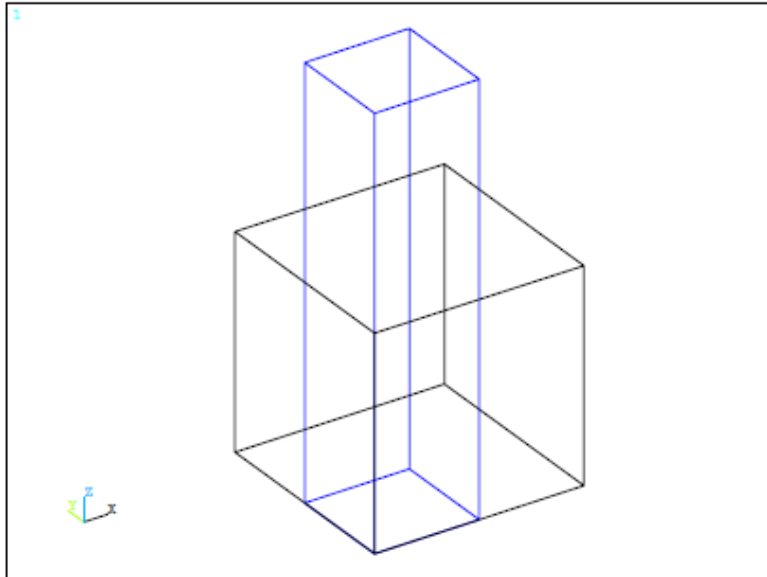
$$G(\tau) = G_0 \left\{ 1 - \sum_{i=1}^N \bar{g}_i^P \left( 1 - e^{-\tau/\tau_i^G} \right) \right\}, \quad K(\tau) = \infty$$

Actual measurement along with fitted curve



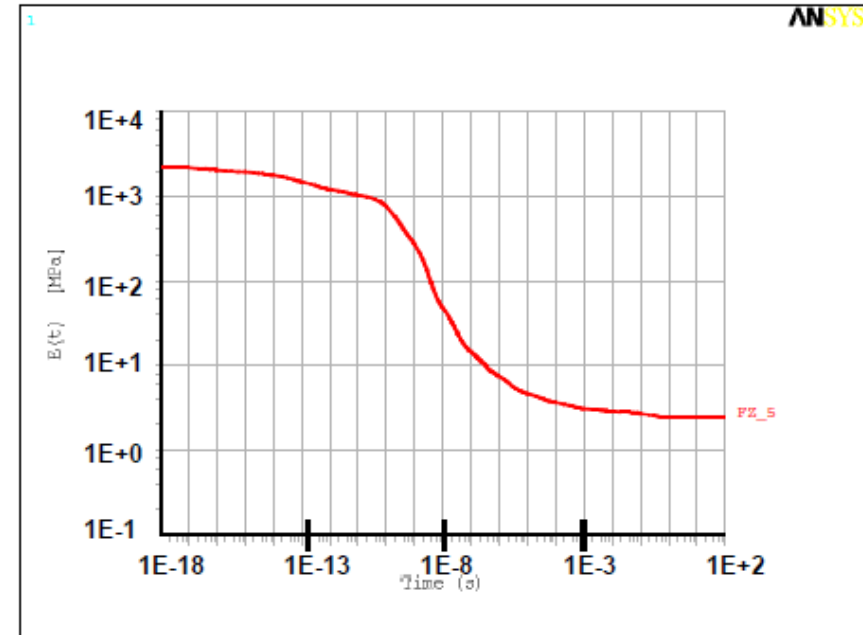
# Stress-relaxation analysis : mat1\_hs50\_relax\_ansys.dat Hardness (50), Damping (Small)

ANSYS 10.0



Hexahedron (1mmx1mmx1mm)  
Keeping 1mm enforced displacement

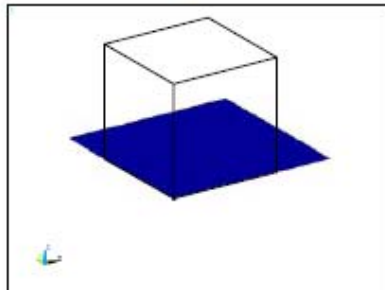
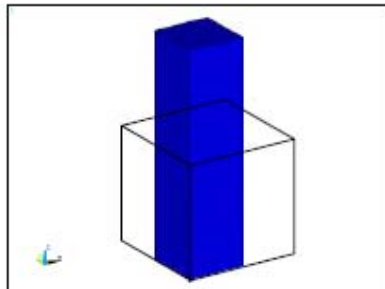
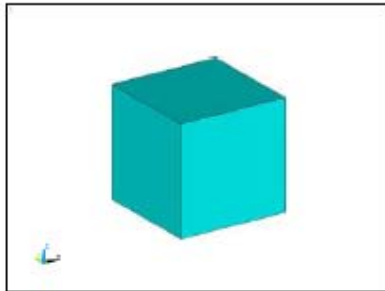
**Analysis model**



**Stress-relaxation curve**

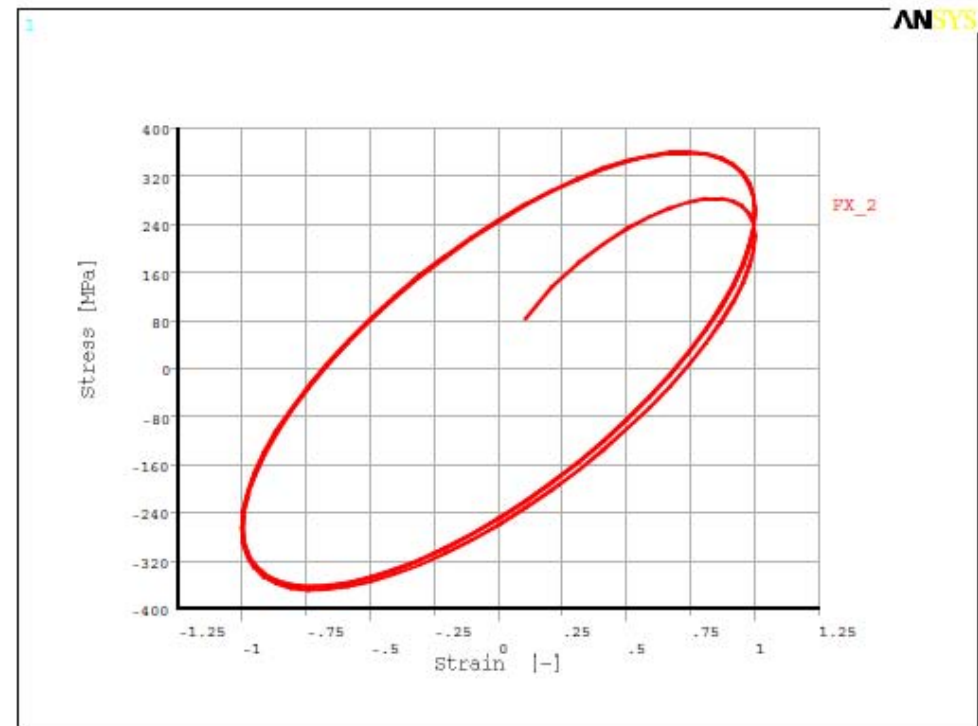
# Harmonic vibration analysis (mat1\_hs50\_freq\_ansys.dat) Hardness (50), Damping (Small)

ANSYS 10.0



Amplitude  $A = 1\text{mm}$   
Frequency  $f = 10^8\text{Hz}$   
Displacement  $\delta = A \sin 2\pi f t$

Analysis model



$10^8\text{Hz}$  hysteresis curve