Supplementary Information

Pronounced Plasticity Caused by Phase Separation and β-relaxation Synergistically in Zr–Cu–Al–Mo Bulk Metallic Glasses

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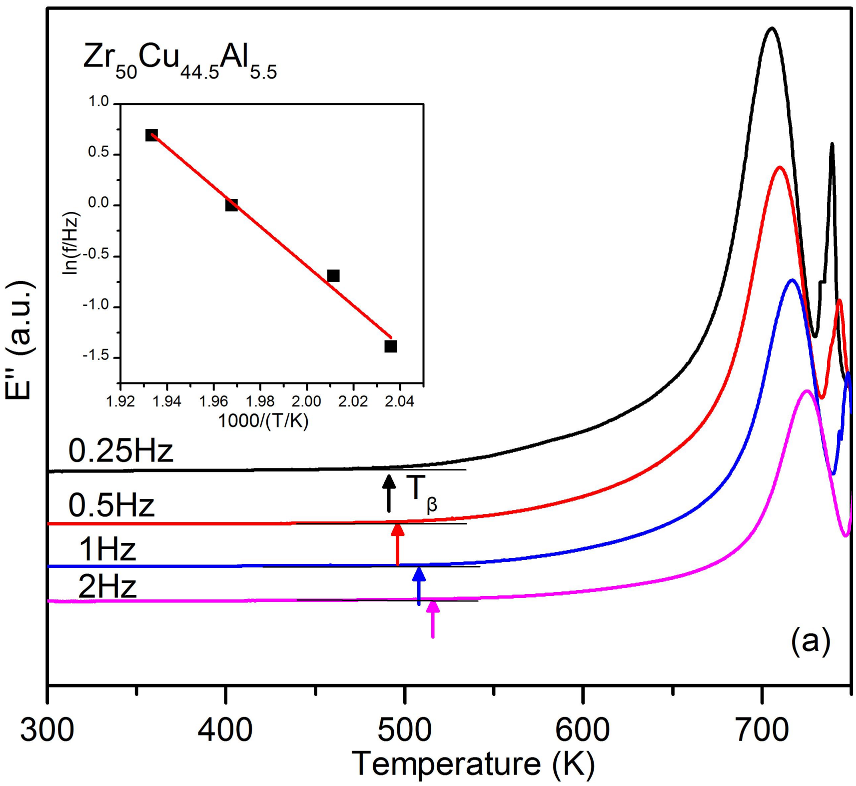
Supplementary Figures



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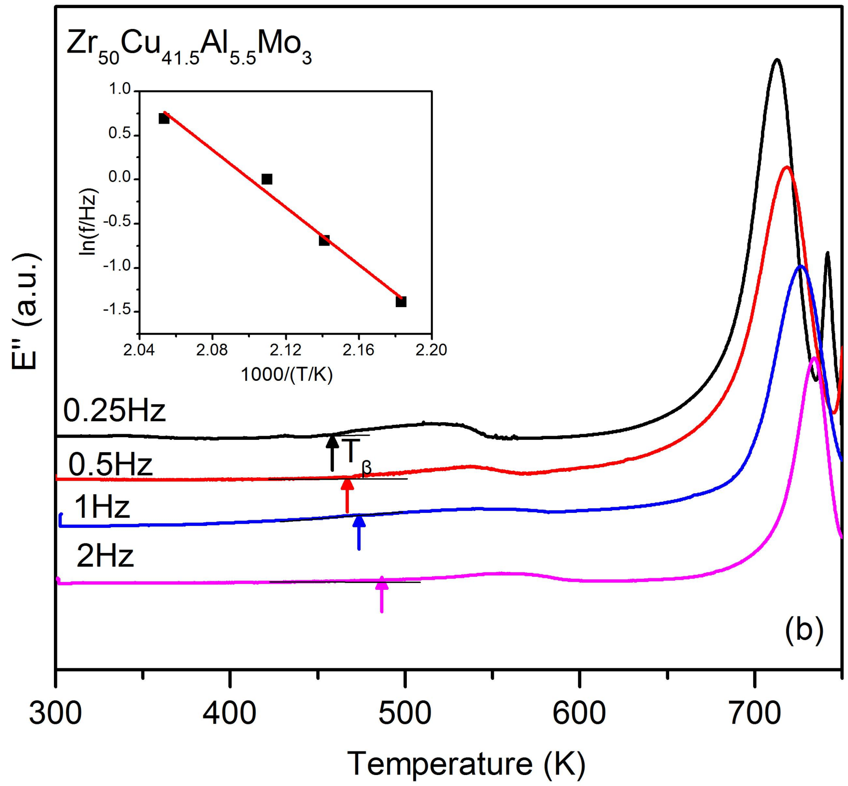

Fig. S1 The temperature dependence on the loss modulus *E"* measured with frequency *f* , the inset plots are *ln(f)* vs the onset temperature of β-relaxation (T_β) for the alloys: (a) $Zr_{50}Cu_{44.5}Al_{5.5}$ (b) $Zr_{50}Cu_{41.5}Al_{5.5}Mo_3$

Supplementary Note

The temperature dependence on the *E"* as a function of frequency (*f*) is shown in Fig. S1. The inset of Fig. S1 shows the *f* dependence on the onset temperature of β-relaxation (T_β) which is marked on the DMA curver. These points were fitted by the Arrhenius equation

$$f = f_\infty \exp(-E_\beta / RT) \tag{1}$$

Where f_∞ is the prefactor, E_β is the activation energy of β-relaxation, *R* is the ideal gas constant and *T* is the temperature. The Eq. (1) can be also written as

$$\ln(f) = \ln(f_\infty) - E_\beta / RT \tag{2}$$

So, $-E_\beta/R$ is the slope of the line on a plot of ln(*f*) versus $1/T_\beta$.

The E_β is determined to be 162 ± 12kJ/mol and 135 ± 11kJ/mol for $Zr_{50}Cu_{44.5}Al_{5.5}$ (ZCA) and $Zr_{50}Cu_{41.5}Al_{5.5}Mo_3$ (ZCAM3) from the Arrhenius plots, resepectively. And these values are corresponding to ΔE_1 and ΔE_2, resepectively.