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How melt stretching affect the brittle-ductile transition temperature of polymer glasses SHIWANG CHENG, SHI-QING WANG, University of Akron — Upon increasing temperature a brittle polymer glass can turn ductile. PMMA is a good example. For a while this brittle-ductile transition (BDT) was thought to be determined by the emergence of a secondary relaxation....[1−3] On the other hand, it has been known for a long time...[4−6] that predeformation in the melt state (e.g., melt stretching) can also make brittle glasses behave in a ductile manner. This transformation has recently received a satisfactory explanation based on a picture of structural hybrid for polymer glasses....[7] It appears that BDT is dictated by the relative mechanical characteristics of the primary structure (due to the van der Waals bonds) and the chain network. The present work, based on conventional Instron tensile extension tests and DMA tests, shows that melt stretching does not alter the secondary relaxation behavior of PMMA and PC yet can turn them the brittle PMMA ductile and the ductile PC brittle. Moreover, sufficient melt stretching makes the brittle PS ductile although it does not produce any secondary relaxation process. .1. Monnerie, L.; Laupretre, F.; Halary, J. L. *Adv. Polym. Sci* **2005,** 187, 35-213. 2. Monnerie, L.; Halary, J. L.; Kausch, H. *Adv. Polym. Sci* **2005,** 187, 215-364. 3. Wu, S. *J. Appl. Polym. Sci.* **1992,** 46, (4), 619-624. 4. Vincent, P. I. *Polymer* **1960,** 1, (0), 425-444. 5. Harris, J. S.; Ward, I. M. *J. Mater. Sci.* **1970,** 5, (7), 573-579. 6. Ender, D. H.; Andrews, R. D. *J. Appl. Phys.* **1965,** 36, (10), 3057-3062. 7. Zartman, G. D.; Cheng, S.; Li, X.; Lin, F.; Becker, M. L.; Wang, S.-Q. *Macromolecules* **2012,** 45, (16), 6719-6732.

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