Glass-transition temperature (tg) of . hdpe

Skip to Table of contents Living reference work entryFirst Online: 12 January 2016DOI: On the macroscopic scale, the glass transition temperature Tg represents the temperature at which a material transforms from a stiff glass into a viscous liquid or rubber-like material. In addition to polymers, which are the most common materials with a glass transition temperature, various amorphous solids, organic liquids, alloys or inorganic glasses may also have a glass transition. On a molecular scale, the Tg of a polymer is the temperature at which large segment movements of the polymer chains become possible within the time scale of the experiment. The glass transition temperature depends on the molecular architecture. Substituents that restrict the backbone rotation of a very simple polymer such as polyethylene increase its Tg, and the presence of polar groups will have an even stronger effect (Table 1). In addition to the substituents on a flexible polymer backbone, the chemical structure of the backbone itself obviously has a great influence on the glass... Glass Transition Glass Transition Temperature Polymer Blend Porous Membrane Steam Permeable These keywords were added by the machine and not by the authors. This process is experimental and the keywords can be updated as the learning algorithm improves. This is a preview of the subscription content, sign in to verify access. Andrews RJ, Grulke EA (1999) Glass Transition Temperatures of Polymers. In: Brandrup J, Immergut EH, Grulke EA (eds) Polymer handbook, 4th edn. Wiley, HobokenGoogle ScholarElMiloudi K, Djadoun S, Sbirrazzuoli N, Geribaldi S (2009) Mixability and phase behavior of binary and ternary homovisors of poly(styrene co-acrylic acid), poly(styrene-co-N, N-dimethylacrylamide) and poly (styrene-co-4-vinylpyridine). Thermochim Acta 483(1-2):49-54CrossRefGoogle ScholarMatteucci S, Yampolskii Y, Freeman BD, Pinnau I (2006), Transport of gases and vapours in glassy and rubber-like polymers, In: Yampolskii Y, Pinnau I, Freeman BD (Eds.) Materials science of membranes for gas and steam separation, John Wiley & Sons, Ltd, Uk. doi: 10.1002/047002903X.ch1Google ScholarMcKeown NB, Budd PM (2010) Use of intrinsic microporosity in polymer-based materials. Macromolecules 43(12):5163-5176CrossRefGoogle Scholar© Springer-Verlag Berlin Heidelberg 2015Johannes Carolus JansenEmail autor1. Institute of Membrane Technology, ITM-CNRRende (CS)Italy The plastics & Elastomers material selection platform The glass transition temperature (Tg) is one of the most important thermophysical properties of amorphous polymers. It is sometimes referred to as the melting point of amorphous materials and unscientific this sounds, it is an appropriately descriptive description for the glass transition. In the high viscosity region above the Tg Materials are soft and rubbery, wheras below the Tg, polymers are hard and brittle. However, there is an important difference between glass transition and melting; Melting is a real transition to the first-order phase, while glazing (glazing) is only a transition to pseudo-second order, i.e. melting causes discontinuity in the first dissipation of Gibbs-Free Energy (volume, entropy), while glazing causes a (pseudo-)discontinuity in the second derivative of gibbs free energy (e.B. The glass transition is a complex process that is influenced by a number of factors, including heating rate, aging history, morphology, molecular weight. In fact, the true nature of the glass transition is not well understood. Over the years, several theories have been developed to explain the glass transition. The theories can be divided into kinetic and equilibrium theories. The kinetic theories regard the glass transition as a dynamic process. The glazing or glazing is caused by freezing the movements of chain segments (kinetic units). From very low temperatures, the first (solid) transition occurs when localized binding movements (bending and stretching of bonds) and side chain movements can occur. This is the so-called gamma transition (T). As the temperature rises, other localized movements are activated, which include entire side chain and localized group movements, and the material begins to develop a certain toughness. This transition is called beta transition (T-). With further warming, the Tg is reached. Large-scale coordinated movements of polymer chains occur in this region and a dramatic change in properties is observed. Another theory treats the glass transition as a real thermodynamic transition of the second order. The ideal state of equilibrium cannot, of course, be achieved because it requires an infinite amount of time. The first equilibrium theory of glass transition was developed by Gibbs and DiMarzio (1955 - 1958). They estimated the changes in conforming entropy with increasing temperature and postulated that the compliant entropy becomes zero when a thermodynamic transition of the second order is achieved. Below this temperature, all conatations are essentially frozen. Polymer Tg (K)a,b Polypropylene (PP) 260 (239) Polyethylene (HDPE)* 148* (148, 186, 238) Polymethyl acrylate (PMA) 283 (285) Polypropylene glycol (PPG) 198 (205) Polyvinyl acetate (PVA) 303 (316) Polystyrene (PS) 373 (363) Polytetrafluoroethylene (PTFE) 390 (3 84) Poly(Bisphenol A carbonate) (PC) 447 (435) Poly(ethylene terephthalate) (PET) 345 (346) a Sigma-Aldrich b The Tg in brackets were calculated using the GIM module of Triton Road's 3Ps-Tg software. References JH. Gibbs, E.A.DiMarzio J. Chem. Phys. 28, 373 (1955), 28, 807 (1958) E.A.DiMarzio, JH. Gibbs, J. Polymer Sci. Sci. 1417 - 1428 (1963) LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) in all institutions and individuals. These metrics are regularly updated to reflect usage into the last few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention a research article has received online. When you click on the doughnut icon, a page with altmetric.com is loaded with additional details about the score and social media presence for the specified article. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 2LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) for all institutions and individuals. These metrics are regularly updated to reflect usage into the last few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention a research article has received online. When you click on the doughnut icon, a page with altmetric.com is loaded with additional details about the score and social media presence for the specified article. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 3LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) for all institutions and individuals. These metrics are regularly updated to reflect usage into the last few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention a research article has received online. When you click on the doughnut icon, a page with altmetric.com is loaded with additional details about the score and social media presence for the specified article. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 4LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) for institutions and individuals. These metrics are regularly updated to reflect usage into the last few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention that a received articles online. When you click on the doughnut icon, a page with altmetric.com is loaded with additional details about the score and social media presence for the specified article. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 5LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) for all institutions and individuals. These metrics are regularly updated to reflect usage into the last few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention a research article has received online. When you click on the doughnut icon, a page with altmetric.com is loaded with additional details about the score and social media presence for the specified article. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 6LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) for all institutions and individuals. These metrics are regularly updated to reflect usage into the last few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention a research article has received online. When you click on the doughnut icon, a page with altmetric.com is loaded with additional details about the score and social media presence for the specified article. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 7LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) for all institutions and individuals. These metrics are regularly updated to reflect usage into the last few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention a research article has received online. When you click on the doughnut icon, a page with altmetric.com with additional details about the score and the social media presence loaded the specified item. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 8LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) for all institutions and individuals. These metrics are regularly updated to reduce the usage that the a few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention a research article has received online. When you click on the doughnut icon, a page with altmetric.com is loaded with additional details about the score and social media presence for the specified article. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 9LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) for all institutions and individuals. These metrics are regularly updated to reflect usage into the last few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention a research article has received online. When you click on the doughnut icon, a page with altmetric.com is loaded with additional details about the score and social media presence for the specified article. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 10LEARN ABOUT THESE METRICSArticle views are the COUNTER-compliant sum of full-text article downloads since November 2008 (both PDF and HTML) for all institutions and individuals. These metrics are regularly updated to reflect usage into the last few days. Quotes are the number of other articles that quote this article, calculated by Crossref and updated daily. Learn more about the number of crossref quotes. The Altmetric Attention Score is a quantitative measure of the attention a research article has received online. When you click on the doughnut icon, a page with altmetric.com is loaded with additional details about the score and social media presence for the specified article. Here you can find more information about the Altmetric Attention Score and how to calculate the score. Page 11Page 12 12