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reaction. The temperature value is chosen to ensure that the initiator has a high decomposition rate (resulting in a large number of free radicals and, indirectly, more nuclei and microspheres, as well as dilutions with high salting power). These factors contribute to a smaller pore size as the rate of polymerization increases with temperature (Okay 2000; Beetroot and Frechet 1995). The polymer solubility in monomers is characterized by the solubility parameter. The small difference between the solubility monomer and the polymer parameter implies that the enthalpy mix of these two components is small. Such systems avoid a sampling of agglomeration, and the absence of defects indicates that the two particles are combined and they are connected within a short period of time. Although there is a difference in density between a monomer and a polymer, the droplets do not break down because there is a crosshair. The solubulance parameter is a convenient measure that assesses the strength of the polymer system and affects the morphology of the beads. Compatibility of solvent and polymer can be semi-unique using the solubility parameter (Tang et al. 2015; Vlad et al 1997). The polymerization of mass and suspension follow the same principles when all components of the system are soluble in a monomeric phase (initiators, macro-radical, chain transmission agents). The rate of polymerization does not depend on the size of the particles and the type of stabilizer. With the polymerization of the suspension, the cross-sectional formation of polymers from mono- and polyunsaturated monomers occurs through the free radical interbreeding of chains (Elliott and Bowman 2002). At the beginning of (joint) polymerization, only a few linear polyfunctional macromolecules (which remain dissolved in monomers) are formed. Radical cross (co)polymerization (CRR) has several specific behaviors. The main feature is the process of initiating growing chains, a process that causes morphological differences as a result of interconnected structures. In terms of elementary reactionary steps, free-radical interbreeding (joint) polymerization begins with initiation, occurs by distribution (in which monomers are added to the active ends of the growing chains, accompanied by chain transmission), and ends with cessation reactions (when the active chain ends deactivated). Differences arise from the presence of unsaturated monomers. This can be incorporated into the growing chain of one double bond. Others that remain pendant (free) can participate in (joint) polymerization, so, gradually, the chains are joined by a pendant ties, and thus the way cross-references. It is often the case that the chemical reactivity of suspension bonds is equal to the reaction of a polyunsaturated monomer; in this case, the copolymerization scheme is identical to the linear binary copolymerization scheme. Macroaradic has various growth opportunities, reacting with the following to form a covalent bond: Double bond of polyunsaturated monomer Other suspension bonds - Active end of the same chain (intramolecular cyclization is interconnected) Active end of the growing free chain (intermolecular interbreeding) During the cross-process, there are two types of cyclization: (1) cycling with a double suspension bond from the same molecule and (2) looping with a double bond from another existing chain in the same molecule so-called multiple cyclization. At the beginning of the polymerization process, there are only a few pendant double bonds in the reaction system that can be involved in intermolecular cross-referencing. An intramolecular cyclization reaction can occur if the cycle closure is supported by chain flexibility. For unequal reactivity of vinyl groups, the scheme corresponds to the scheme of krautrap copy-measurement. Thus, there are exclusively intramolecular cross-connections at the beginning of the process. Cycles of different sizes are formed, with the smallest cycles having the highest probability of formation. A very important cyclization occurs when the reaction system contains a large number of dimyl-monomers (Vlad and Vassiliu 2010). However, a sharp decline in the reactivity of the double bond pendant appears. This feature of cross-sharing polymerization is explained by the fact that many of these links are trapped inside cycles. To completely convert monomers, the presence of double connections in the reaction system supports the inaccessibility of these links. Internal interbreeding results in a very compact microgel structure. The insides of the suspension groups are extremely immobile and although they are reactive, they do not react with monomers because monomers cannot dissipate them. Only mobile suspension links to the periphery of this species (microgel) can respond with macro-radical. Therefore, the trend of microgel formation depends on the length and flexibility of the primary chain; the ability to access unedited dual bonds from within (their visible reactivity) depends on the size of the microgel, which is reflected in the molecular weight value of the polymer chain. The decrease in the apparent reactivity of the double bonds of the suspension, which produces cross-links, is due to sterile factors leading to the formation of inter- and intramolecular cross-links. These factors strongly control the diffusion in the polymerization response. Specific behavior of the formation of a transverse (joint) polymer structure by a radical mechanism concentration is determined by: (1) an increase in the concentration of unedited double bonds from unsaturated monomeric units (at low conversion) and (2) by an increase in the number of suspended double bonds in the newly formed structure. In the reaction system, the high concentration of polyunsaturated monomer includes a large number of double bonds. At low conversions, cross (co)polymer structures are formed with many unedited double connections. When the conversion increases, the transverse efficiency decreases (the reaction is very difficult for both double bonds). Even with low conversion, the mobility of the formed structures decreases. In terms of the evolution of the three-dimensional structure in cross polymerization, the reactivity of the double bond pendant is highly dependent on spatial correlations, which leads to an increased probability of forming cycles of different sizes and a decrease in the reactivity of double bonds due to the sterile effects caused by the newly formed structure. Increased concentration of crosslinkers leads to the formation of compact macromolecules by internal interbreeding (particles of formed microgel bind through the participation of peripheral vinyl groups during the growth of macroaradica in the liquid phase). The reactivity of the pendant double bonds is strongly influenced by spatial correlations caused by steric effects, and, as a result, increases the probability of cycle formation. Possible reactions in the free radical cross-cross (joint) polymerization of monoand-divinyl-monomers are shown in Vlad's work (2008). Dilution promotes contact between particles, and macroaradic is likely to attack the peripheral vinyl link in the same particle. Paradoxically, the increase in conversion does not increase the heterogeneity of the system. The spaces between the particles are gradually filled with a new polymer formed from monomers (peripheral vinyl groups participating from all existing particles), so that the unfused in density are aligned (the heterogeneity disappears). Adding dilution to the polymerization system leads to the formation of heterogeneous permanent structures (with pores, after drying). To produce a hard porous material, the disjunct liquid of the polymerized mixture must contain not only monomers, but also a bombed environment. An unloaded environment is called a threshold and should not react during polymerization; it should remain within the newly formed beads surrounded by polymerized material. Finally, the threshold is removed and the places it occupies become pores of the appropriate structure. Several features of free-radical cross-radical (co)polymerization make modeling of network formation very difficult. Because monomers themselves act as dilution in the process of cross (joint) polymerization and monomers and (joint) polymers depends on the duration of polymerization, the question of how to find a critical transformation in which the phase is divided (described as a function: phase equilibrium versus conversion) becomes very important. In addition to the phase separation effect, the separation produces other effects, such as lowering the temperature of the glass transition and reaction rate, promoting the cyclization response, and changing chain conformation when it is removed from the network. There are three types of inert media (and/or blends): solvents, unsalted and linear polymers (Krueger et al. 1995). With the use of inert swollen agents (solutions) macromolecular chains of transverse polymer are completely ranted throughout the synthesis process, and the packaging of the nuclei becomes more orderly. As the dilution increases, the size of the chains between the microgel particles (cores) increases, and the removal of the solvent leads to the collapse of the reversible circuits and a return to the form they had at the time of polymerization. You can get beads with a large specific surface area and a small diameter of pores. The resulting polymers become a porous solvent. An inert, ideal unsalted environment is difficult to find, because in the liquid phase the reaction system always contains monomers - unsalted character is aggravated by an increase in the degree of transformation. The rapid nature of the inert environment depends on (1) the initial concentration of monomers, which are an appropriate solvent for (co)polymer and (2) inert medium((co)polymer interaction parameter. This, in turn, determines an increase in the degree of permanent packaging chains and, consequently, an increase in the degree of effective interbreeding, which is manifested in the decrease in volume. The difference between the volume of the copolymer and the original monomers will increase as precipitation increases (resulting in an increase in porosity over the values corresponding to the amount of inert environment from synthesis) (Bradford et al. 1955). Linear polymers are part of the macromolecule inert multimedia category. They bring a large number of variables into the reaction system, because changes in the chemical composition, as well as in the molecular weight and its distribution affect porosity. When using inert polymer media, the rapid nature of these macromolecular compounds depends on the degree of incompatibility with the newly formed (co)polymer. This incompatibility is responsible for phase separation at a much lower concentration for this type of inert environment compared to others. A mixture of linear polymer and good solvent as an inert medium can be used to produce copolymers with a porous structure in more favorable conditions than using a single component as an inert medium. The presence of solvent in the polymer polymer to a more even distribution of the inert polymer environment in the network, thereby increasing the degree of dispersion of the copolymer. The mixture can affect the size and distribution of pores because it acts as a unit of inert environment - these two components are inseparable and cannot react independently. A mixture of inert environment swelling along with an inert precipitation environment with small molecules is often used to produce copolymers with specific structures. The ratio of two inert drops depends on the purpose of the polymer. In this case, the milder nature of phase separation and the high degree of polymer variance result in notable specific surfaces (Cheng et al. 1992). Theoretically, mixtures consisting of two inert sources of precipitation, one with small molecules and the other with a macromolecule structure were studied. In this case, the size of agglomerates increased significantly, resulting in products with very low mechanical strength. To understand the formation of pores during the polymerization of suspension, imagine that each drop is a spherical microreactor, a spherical form provided for the final polymer by mixing and interfacial voltage. As a result of cross and solvolateral changes associated with the increase in the length of the polymer chain, macromolecules are formed within this microreactor sediment in the environment that surrounds them (breed/monomeric mixture). This phase separation occurs at the very beginning of polymerization, resulting in the formation of microscopic ball formations that begin to grow and are not coal due to cross-crossing. Eventually, they coexist with each other and, in an associated form, lead to clusters consisting of interconnected cells and voids (pores). In fact, each drop turns into a micropilled ball, the free volume is well correlated with the used percentage of the rocked. The formation of a macro-positive structure is determined solely by the behavior of the interconnected chains obtained in the (joint) polymerization reaction. The processes taking place at this stage can be described as follows: the originally formed microgel (nucleus) particles are connected by chains that contain very few cross molecules. This area of low cross-bond is very swollen in the periuous/monomeric mixture. When the new structure dries, it does not completely break down, and the formation of pores corresponds to the spaces between the particles. The change in the bombative thermodynamic quality reflects the different degree of association of nuclei. The heterogeneous nature of cross-polymerization is not sufficient to form a two-tas structure (the second phase refers to bombardment or voids after drying). Therefore, the mechanism of phase separation (Hsiao et al. 1995), which appears near the limit of thermodynamic stability, is very important. Teh separation in the presence of an inert environment occurring during cross-formation was studied using Florey's thermodynamic theory (Dusek and Dusková-Smrckova 2000). Because monomers themselves act as developmentals, phase separation will depend heavily on the time of polymerization, the phase equilibrium described by the transformation function. The model scheme for the formation of three-dimensional macro-threshold structures (Scheme 3.1) shows the steps that occur in the process of polymerization of the suspension. Each particle (which can be considered as a microreactor) consists of a monomeric solution, initiator and bomb (I). This organic phase is suspended in the aqueous phase containing the suspension stabilizer. Scheme 3.1 Model scheme of formation of three-dimensional porous structures. (Adapted from Vlad Kristina Doina. Polymerization of suspension. The reaction of polymerization leads to (joint) polymeric molecules, rich bis- or polyunsaturated components, which still contain a large number of unedited double bonds. Proliferation, cyclization and cross-reactions lead to weak intermolecular cross primary nuclei (due to defrozing), intramolecular cross microgels and linear circuits soluble in unedited monomers. The presence of a low number of intermolecular bonds among newly formed nuclei leads to a low cross area that swells in the warm-up/monomeric mixture. The cross-formation of polymers causes a phase separation between the cross polymer and the inert environment, with monomers distributed between the two phases (II). Since the weak transverse polymer is swollen in other monomers, it behaves like fluids that (due to interfacial voltage) take the most stable form in terms of energy. Thus there is a mass separation of microspheres (III). When this microgel is formed, the minimum energy of the drop is achieved on the basis of the deformation of the network (observed when the volume changes). At high conversion of monomers there is a formation of macro-gel-like and microsphere agglomerations (IV). The first stage of the formation of a porous structure is the production and aggregation of highly displaced microspheres. The second stage is the binding and fixation of microspheres and their agglomerations. This is achieved by promoting the cross-reaction of polymerization in the formation of new nuclei. Based on the consumption of monomers, these nuclei link existing structures in the system (V). The inert environment is currently located in the spaces between microspheres and their agglomerates. These places occupied by an inert environment become network pores after it is removed, and they determine the properties of the macroporous structure (shape, size distribution, etc.). All porosity theory is based mainly on phase separation (PS) and the power of threshold soling. A large amount of crosslinker is needed for the production of macroporous resin to facilitate the phase separation between the polymer and the threshold during synthesis. Different phase morphology is obtained and determined by competition between phase separation kinetics and cross-chemical reaction. The physical properties of the transverse polymer are highly dependent on its phase-dividing morphologies. Among the methods used to study phase separation (PS) are: Thermally induced phase separation (TIPS); increased reaction temperature, or high concentration, produces a high connection phase structure, so that polymerization exceeds phase separation; using the low temperature stage there is a moderate decrease in phase separation at a lower nucleation temperature (Kim et al. 2016; Padilla et al. 2011; Steiger et al. 2003). Unsolvilized separation phases (NIPS). Combined NIPS-TIPS (N-Tips). Polymerization of induced phase separation (PIPS) (Yuhong 2013). The increase in the size of the growing polymer molecules and the result of morphology (stabilized by gelling in cross-polymerization) are the main factors influencing PIPS. PIPS processes are influenced by thermodynamic and kinetic factors that can determine: stable systems (where phase separation is not performed), metastable systems (when phase separation may occur) or unstable systems (for which phase separation does not occur). The mechanism of phase separation during the porous transverse synthesis of the polymer involves the sudden appearance of heterogeneity, when the threshold concentrations of the crosslinker and the bomb is achieved by forming a porous structure with very large sizes compared to the primary nuclei important influences regarding the quantity and quality of the bombardation Change in the quality of the solvent from good to poor, from temperature increase, eventually leads to phase separation (Sger ettie). When the reaction occurs in both scattered and continuous phases, despite the low one-dimensional saltiness in the water, the thermodynamic equilibrium between the continuous and scattered phase is established before the polymerization (Nzihou et al. 1997). Thresholds can be used to increase the section of the water-soluble monomer in drops when the continuous phase of water (Gokmen et al. 2012). In order to obtain a heterogeneous system, a phase separation must take place during the cross-crossing process so that a disparate structure can be fixed by forming new cross-lines of communication. A feature of cross(joint) polymerization is the formation of networks at relatively low conversions at a time when these (Network) heavily swollen in a mixture of mixture as a result of the phase separation, starting close to the gel point. The influence of quantity and inert average thermodynamic quality in the formation of pores depends on the moment at which the phase separation takes place. As a function of the (joint) stage of the polymerization reaction, phase separation can occur three different times: to the point of the gel, when the lower rough structures are produced. This is because the difference between the amount of polymer phase and rant is high (in this case, before the structure is corrected by cross-crossing, there is a merging phenomenon). Long after the point of the gel (after the formation of cross-references), when the high density of interbreeding from the polymer prevents the microseparation of the liquid and the exception occurs outside the polymer (macroresins). A thin porous structure is created that determines the high specific appearance of the surface. At the point of the gel. The best moment to start a phase separation is at the gel point, when the dispersal structure is fixed by the formation of new cross lines. When networks are formed from unstable systems, when cross-binding density changes very quickly, the rebalancing is due to the reorganization of an interconnected structure. Due to rapid changes in the composition, the phase separation is accompanied by macro-granulation due to the co-ordination of the increasing particle. With high crosslinker concentrations and high dilution, the volume transition phenomenon appears along with phase separation. Macrosynthesis occurs after the point of the gel, when cross-references form a coherent network. The beginning of phase separation can be established by combining the equilibrium effects that change in the system due to the conversion and swelling of the network. Microsineresis is a consequence of polymer solvent interaction and occurs during the formation of a network (cross-communication). Microsneresis is not stable in time; it is a non-acteria phase that takes place in an equilibrium synthesis (macrosinerez). This transition from micro-to-macro-generalisis is caused by network deformation, which explains the change in volume that occurs in related structures. The porous copolymer volume is often higher than the volume of the liquid phase (consisting of monomers and inert environments) because the adoption monomer network on the swollen network determines the expansion of the network volume. Thus, the formation of the mechanism of porous structures is not due to the homogeneous nature of cross (joint) polymerization, as well as the phase separation process (defined by thermodynamics of the system). Particle morphology is the factor that determines the commercial use of these polymers. In the dried state (co)polymer beads are characterized by their true (skeletal) and visible density, general porusness, total volume of pores, sizes, distribution of pore size and their specific surface area. The shape and structure (morphology) of the beads depend on the conditions of polymerization and on the physical properties of the system. The conditions of polymerization that particularly affect particle morphology are as follows: The merging and variance of droplets before and during polymerization Changes the density between the monomer phase and the polymer phase of monomer solubility in the polymer Where monomers are soluble during the coolymeration reaction, they are evenly distributed in the reaction phase (monomer in the polymer drop). But, in cases when the copolymer swells in monomers, two different compositions for the polymer drop are obtained: one is rich in polymers, and the other is rich in monomers. If the compositions are quite different, different structures can be obtained by polymerizing the two stages. The swelling of various copolymers is a quantitative method for the characteristics of cross beads. Tumor and de-swelling volume depends on cross density (Vlad and Mihalecsu 2001). The merging/variance factor is responsible for particle scattering or agglomeration. Changes in the ratio of the system's qualitative and quantitative components during the cross-reaction can lead to particle collapse (a lower polymer density, compared to a monomer, generates pearls with a lower volume than the original drop). Controlling the distribution of pore size is important in a (macro) porous polymer structure. For example, small pores and large specific surfaces are typical characteristics of beads used in a column of chromatographic fillers, while beads with large pores are used in the separation of nucleic acid or in enzyme immobilization. Polydispersity is characterized by the use of special equipment for high-precision optical measurements - atomic force microscopy (AFM), scanning electron microscopy (SEM) and electron transmission microscopy (TEM). Numerous experiments on suspension polymerization have revealed technical and economic advantages: low costs compared to a wide variety of particle properties. Excellent heat transfer and processing of materials during the conversion of monomers into polymer. The ability to control the size of the balloon. The use and separation of the resulting beads are simple procedures. The polymerization system uses few components (compared to emulsion methods). The process of cleaning the final product is relatively simple. It can be stored in bins or tanks in accordance with the manufacturer's instructions on the temperature of storage and the shape of the beads. Typical transverse polymers have no porosity, except when they are swollen in solvents. Once resolved, the polymer chains separate from each other, and they form it it places (spaces) filled with solvent. This limited swelling occurs for low cross-polymers or macroporous gels (products are easily deformed under pressure) and usually excludes their use in the form of a ball (e.g. in liquid chromatography). Macroporous polymer beads synthesized by suspension polymerization are a class of polymer beads containing a constant, well-developed porous structure in a dry state and having a wide range of applications, such as catalyst support, enzyme immobilization, HPLC columns, release of active substances or adsorbents. Beads are produced in the presence of a threshold (an inert substance for monomers), which remains embedded inside the polymer bead and is finally removed to create grain pores. The internal structure of macroporous beads consists of many interconnected cavities (pores) of different sizes, with the rigidity of beads due to extensive cross-references. Their porous structure improves the diffusion of various solutions through the polymer network. Since these networks have special properties, such as a high degree of interbreeding and a rigid structure in both swollen and dry conditions, it is very interesting to study the conditions of their synthesis (Gomez et al. 2012). Macro-resistant rigid polar organic beads are commonly used for acceoth chromatography of size exclusion (SEC), for hydrophobic interaction and affinity of chromatography of biopolymers (Svec and Regnier 2002), or for the study of retention properties (Mingcheng et al. 2003). Significant progress has been made in the development of porous polymer designs used in areas that focus on improving life (cosmetics, eye implants and bones) (Chalasan et al. 2007). Recently, more interest in porous polymers is due to their controlled porous structure, as well as their mass transmission and binding ability. Using a single-step tumor and polymerization method, monodispersive macroporous particles are used as a supporting matrix. This new, macro-porous core-printed material can be a powerful tool for rapid and efficient enrichment and separation of target compounds from complex samples (Yongliang et al. 2014). Two types of morphology in cross polymer resins are commercially available and have been investigated: the type of gel and macroporous resin. Relatively rigid macro-porous resin is available as solid opaque beads with permanent pores (Van de Steene et al. 2014). Optimizing porous polymer synthesis methods using the drying freezing method, very effective arsenic extraction adsorbents were obtained (Taleb et al. 2015). Storage is a prerequisite in the development of hydrogen vehicles. In this regard, porous carbon materials have attracted considerable attention as attractive candidates for storage because of their good good low cost and high surface area (Jianwei et al. 2012). This chapter examines interconnected polymers with constant porosity and factors influencing their synthesis, formation mechanism and properties. The characteristics of these polymers can be made on the basis of the theory of network formation or on experimental results. Because of the differences between experimental results and theoretical projections, separate methods are used to identify areas of uncertainty that need further study. Until the last century, cross polymers were studied only by their applique properties. Today, the methods of characteristics allow to study the factors influencing the formation mechanism, as well as the balance between the parameters of the reaction and properties. Depending on the necessary properties, this suggests that the porous transverse polymer can be prepared for a specific purpose, given the influences and mechanisms of phase separation that develop during synthesis. 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A. 1323 (2014): 11-17. Yuhong Liu. Polymerization of induced phase separation and, as a result, thermomechanical properties of thermosry/reactive nonlinear polymer mixtures. J. Apple. It's Polym. 127 No 5 (2013): 3279-3292. Page 2 phase morphology in multi-component polymer systems is a basic physical characteristic that allows you to control the structure of the material and implicitly develop new plastics. Emphasizing the properties of these promising new materials in both the solution and the solid phase, this book describes the preparation, processing, properties and practical effects of advanced multiphase systems from macro to nanoscale. It covers a wide range of systems, including copolymers, mixtures, polymer composites, gels, inter-ception polymers and layered polymer/metal structures describing aspects of polymer science, engineering and technology. The book analyzes experimental and theoretical aspects concerning thermal and electrical transport phenomena and magnetic properties, which are crucial in advanced technologies. It examines the most recent advances in morphological, reological, interfaith, physical, fire-resistant, thermophysical and biomedical properties of multiphase polymer systems. In this regard, the book is devoted to the basic methods of research, which are sensitive in figuring out the features of each stage. It also discusses the latest research trends that offer new solutions for advanced bio- and nanotechnology. Presents an overview of recent research in multiphase polymer systems, their micro- and nanostructural evolution in advanced technologies, and provides future perspectives, new challenges and opportunities. Multi-component structures are discussed, which offer improved physical, mechanical, thermal, electrical, magnetic and optical properties adapted to the modern requirements of modern technologies. Covers a wide range of materials such as composites, mixtures, alloys, gels and interchangeable polymer networks. Introduces new strategies to control the micro and nanomorphology and mechanical properties of multiphase polymeric materials. Describes various applications of multiphase polymeric materials in various fields, including automotive, aeronautics and space industry, displays and medicine. Content Table Page 3 3

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