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Chemistry Ebook: The Chemistry of Polymers Third Edition By John W. Nicholson



Modern books about polymer chemistry explain that the word polymer is derived from the Greek words 'poly' meaning many and 'meros' meaning part. They often then infer that it follows that this term applies to giant molecules built up of large numbers of interconnected monomer units. In fact this is misleading since historically the word polymer was coined for other reasons. The concept of polymerism was originally applied to the situation in which molecules had identical empirical formulae but very different chemical and physical properties. For example, benzene (C6H6; empirical formula CH) was considered to be a polymer of

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acetylene (C2H2; empirical formula also CH). Thus the word 'polymer' is to be found in textbooks of organic chemistry published up to about 1920 but not with its modern meaning.

A polymer is a large molecule built up from numerous smaller molecules. These large molecules may be linear, slightly branched, or highly interconnected. In the latter case the structure develops into a large three-dimensional network. The small molecules used as the basic building blocks for these large molecules are known as monomers. For example the commercially important material poly(vinyl chloride) is made from the monomer vinyl chloride. The repeat unit in the polymer usually corresponds to the monomer from which the polymer was made. There are exceptions to this, though. Poly(vinyl alcohol) is formally considered to be made up of vinyl alcohol (CH2CHOH) repeat units but there is, in fact, no such monomer as vinyl alcohol. The appropriate molecular unit exists in the alternative tautomeric form, ethanal CH3CHO. To make this polymer, it is necessary first to prepare poly(vinyl ethanoate) from the monomer vinyl ethanoate, and then to hydrolyse the product to yield the polymeric alcohol. The size of a polymer molecule may be defined either by its mass or by the number of repeat units in the molecule. This latter indicator of size is called the degree of polymerisation, DP. The relative molar mass of the polymer is thus the product of the relative molar mass of the repeat unit and the DP.

Brief content from The Chemistry of Polymers Third Edition By John W. Nicholson:

Chapter 1 Polymer Chemistry

Chapter 2 Polymerisation Reactions

Chapter 3 Polymer Structure

Chapter 4 Crosslinking

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Chapter 8 Polymer Degradation

Chapter 9 Dendrimers

Chapter 10 Special Topics in Polymer Chemistry

Chapter 11 Polymers and the Environment

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