

MICROWAVE ASSISTED SYNTHESIS, CROSSLINKING, AND PROCESSING OF POLYMERIC MATERIALS

Dariusz Bogdal and Jan Pielichowski

Department Chemistry and Technology, Politechnika Krakowska Ul. Warszawska 24, 31-155 Krakow. Poland

Microwave technology (i.e., the application of electromagnetic radiation ranges from 0.3 MHz to 300 GHz), has been developed primary for communication and some areas of processing such as cooking food, thawing, and curing wood and rubber. As a heat source, microwaves allow a sample to be irradiated instantly with an associated rapid heating rate. Moreover, microwaves offer a number of advantages over conventional heating such as non-contact heating (reduction of overheating of material surfaces), energy transfer instead of heat transfer (penetrative radiation), material selective and volumetric heating, fast start-up and stopping and reverse thermal effect, i.e. heat starts from the interior of material body.

In the last decade, microwaves have attracted the attention of chemists who have begun to apply this unconventional technique as a routine in their practice. The reduced time of processing under microwave conditions found for a great number of chemical reactions was the main reason that microwave techniques become so attractive for chemists. The result and advantages of microwave processing of material can be increase of productivity, improved product characteristics, uniform processing, less manufacturing space required, and controllability of the process. Microwave processing seems to be easily scaled up from a small batch process to a continuous process employing a conveyor. Besides ceramic, polymer processing forms probably the largest single discipline in microwave technology, and the methods and procedures used therein are certainly seen among the most developed. The purpose of this report is to provide some details concerning the application of microwave irradiation to polymer chemistry and technology. A survey of the past achievements in polymer synthesis can be found together with discussion of the free-radical polymerization, polyaddition as well as polycondensation reactions, crosslinking and processing of polymeric materials with the stress on chemistry of those processes. A short description of the nature of microwaves as well as their interactions with different matter, in particular with organic substances, will be given [1].

1. D.Bogdał, P.Penczek, J.Pielichowski, A.Prociak, *Microwave Assisted Synthesis, Crosslinking, and Processing of Polymeric Materials*, Adv. Polym. Sci. **163**, 193-263 (2003).