PHOSPHORUS-BASED RAFT POLYMERS FOR BIO ADHESION

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In the last few years studies of phosphorus-based polymers have attracted attention because of their large variety of applications. They have been subject of great interest in the fields of flame retardancy, adhesion promotors and tissue engineering. These phosphor-based materials, often bearing a methacrylate moiety for polymerization, are proved to be biodegradable, blood-compatible and lead to strong interactions with bones, enamel or dentin.

In this study, we were interested in the investigation of such polymers on their adhesion properties. Therefore, we synthesized phosphor-containing methacrylates (Figure 1) [1]. The spacer between the carbonyl and phosphor group plays an important role for stability towards hydrolysis. These monomers can bind to hydroxyl, carboxylic or amino groups of the organic collagen of a bone and form complexes with Ca^{2+} ions in the inorganic components.

The synthesized phosphor-containing methacrylates were polymerized via reversible addition-fragmentation chain transfer (RAFT) polymerization. This process has proved to be a highly versatile and widely applicable living radical polymerization method. It allows the synthesis of well-defined polymers with modifiable structures and polymers [2]. As this method is also highly suitable for the building of block copolymers, we prepared block copolymers of phosphomethacrylates (DMMEP) with hydroxyethyl methacrylate (HEMA) as well. The structures of the used RAFT-agents are also shown in Figure 1. The polyHEMA block offers the possibility for further modification of the block copolymers (e.g. by coupling with amino acids). The adhesion properties of the different block copolymers were studied via single-molecule force spectroscopy.

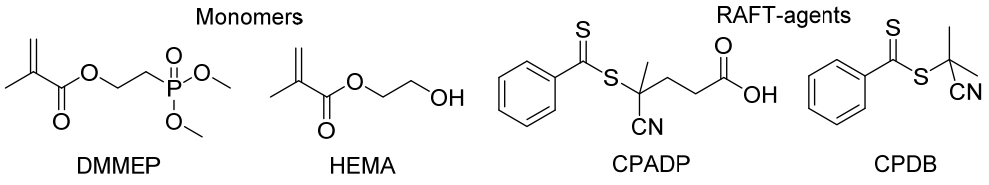

Figure 1: Structures of used monomers and RAFT-agents

[1] S. Monge, B. Canniccioni, G. David and J.-J. Robin, RSC Polymer Chemistry Series, 2014, pp. 1-18

[2] G. Moad, E. Rizzardo and S.H. Thang, 2013, Chem. Asian J., 8: 1634–1644