gel may react with the polymer brush reactants and adversely influence the polymer brush formation. Still yet, some cross-linking sites may act as radical scavengers, and thereby affect polymer brush formation. Additionally, some cross-linking site may act as a metal coordinator, meaning that the metal catalyst utilised in the polymerisation might be absorbed, thereby distorting the polymerisation process.

Despite the above, hydrogels have been used with polymer brushes. From EP 3 385 340 A1, a coating of a hydrogel layer of a polysaccharide and a polymer brush layer is known. The coating is prepared by a) providing a hydrogel layer on a substrate, b) attaching initiators having a radically transferable atom on the hydrogel layer, and c) reacting monomers with the initiators to form polymer brushes attached to the hydrogel layer. Thus, the hydrogel become an integrated part of the polymer brushes and the hydrogel is functionalized with polymer brushes.

The inventors of the present invention have surprisingly found that certain polymer gels are able to promote even distribution of polymerisation reactants and even promote polymer brush formation.

Summary

The present disclosure relates to the formation of polymer brushes. In particular, the disclosure relates to the use of a polymer gel in the formation of polymer brushes. The polymer gel used in the present disclosure is swellable in the polymerisation medium and removable following the formation of the polymer brushes on the surface. Thus, the polymer gel acts as a "container" for the polymerisation medium comprising the reactants needed for forming (or growing) of polymer brushes. The polymer gel provides a number of advantages, including easy application of the reactants needed for polymer brush formation. The polymer gel, when swelled in the polymerisation medium, has a dense structure, which allows for better contact between the polymerisation medium and the surface onto which the polymer brushes are to be formed. Furthermore, the polymer gel as well as excess polymerisation medium may easily be removed from the surface after polymer brush formation. Accordingly, the polymer gel does not react with optional functional groups

immobilised onto the surface or the components of the polymerisation medium, leaving pure polymer brushes after cleaning off the polymer gel.

Thus, in a first aspect, the present disclosure relates to a method for forming polymer brushes on a surface, wherein a surface having polymerisation initiators immobilised thereon is brought into contact with a polymerisation medium, characterised in that a swellable and removable polymer gel is used during the formation of the polymer brushes. A major advantage of using a polymerisation medium in combination with a polymer gel is that the polymer gel swells in the polymerisation medium, and the polymer gel thereby provides a semi-solid or dense carrier for the polymerisation medium, and thereby a carrier for the polymer brush-forming components of the polymerisation medium. This enables formation of polymer brushes on surfaces of all geometries and orientations as the swelled polymerisation medium adheres to the surface during the polymerisation reaction. Another advantage is that the polymer gel slows the migration of oxygen from the surrounding atmosphere to the polymer gel-surface interphase, which gives higher degree of control of the polymerisation reaction creating the polymer brushes.

Thus, the present disclosure relates in particular to a method, wherein the polymer gel is swellable in the polymerisation medium, and wherein the polymer gel is removable following formation of polymer brushes on the surface.

Traditionally, polymer brushes are formed in dip-coating processes, thus, limiting the formation of polymer brushes on larger or more complex structures. In the present disclosure, the polymerisation reaction can proceed easily without the need for the surface/structure to be fully immersed in the polymerisation medium. A further advantage of the disclosure is that the formation of polymer brushes can be directed at specific sites only, whereas the traditional dip-coating may result in unwanted polymer brush formation, if immobilised initiators are present at all sites on the surface/structure.

In an example, the present disclosure relates to the use of a swellable and removable polymer gel in the formation of polymer brushes.

In another aspect, there is also provided the use of a swellable and removable polymer gel in the formation of polymer brushes for evenly distributing a polymerisation medium on a surface having polymerisation initiators immobilised thereon.

Again, the polymer gel is swellable in the polymerisation medium and removable after the formation