Surface Technology, Polymers | Technology Offer

Quat primer polymers – the universal key to permanent surface functionalization

Field of application

The function of a large number of materials is dictated by the properties of their surfaces and interfaces. This is carried out by modifying the material surface. Typical examples are modification of surface energy (wetting), improvement of adhesion of coatings, paints, compatibilization of hybrid materials, improvement of finishing in textiles and introduction of precise surface functionalities such as biocompatibility or antimicrobial properties. For instance, the integration of fibers into a polymeric matrix is a common way to improve the mechanical properties of polymers. When these composite materials are subjected to tension, the most common failure point is the interface between the fiber and the polymeric matrix – an adhesion problem. The quat primer can be utilized as a reactive coating to the fibers. It can promote strong adhesion of the matrix to the fibers and thus improve the overall resistance to strain of the material, saving up costly pretreatments and chemical additives.

State of the art

The vast number of applications and surfaces to be coated relies on various substrate-tailored additives and coating strategies which often require organic solvents and complex reactions. Consequently, an almost unmanageable number of chemical strategies are currently utilized to meet the needs of industry and society. Thousands of additives and an even bigger numbers of coatings are currently commercialized. But until now there is no universally applicable strategy to modify surfaces.

Innovation

Scientists from the Leibniz Institute of Interactive Materials e.V. (DWI) found an innovative way to modify any surface in order to create the desired functionality. Quat-primer polymers consist of a macromolecular carrier bearing adherent groups to attract the molecule to surfaces and provide a strong binding regardless the type and reactivity of the surface. The carrier quat primer provides also other functional groups enabling a plethora of different surface functionalizations and properties by equipping it with other functional groups. The high stability of the primer coating allows the modification even after long shelf storage and the extraordinary stability of the functionalization makes the invention particularly interesting for applications where subsequent improvements cannot be made easily, for example in the case of endoprostheses or composite structures. Some other applications include water and oil repellency, hydrophilization, sizings for paints, self-cleaning surfaces, prevention of biofouling and antimicrobial surfaces. The application can be carried out simply by spraying or dipping and it can therefore be implemented at low cost and on demand.

Your benefits at a glance

- ✓ Universally applicable, simple, environmentally-friendly and cost-effective method
- ✓ Multifunctional coatings
- ✓ Applicable to any material
- ✓ Ultra-thin coating
- ✓ Functionalization on demand
- ✓ Possibility to introduce functionality
- ✓ Possibility to use materials that are difficult to bind

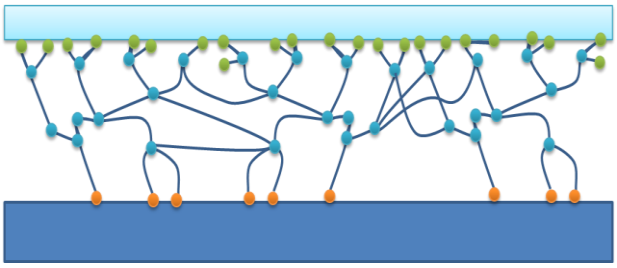

Figure 1: Sketch showing a material surface with few free bonds (bottom), crosslinked quat-primer polymer molecules with adherent groups (center) and permanently bound functional layer (top). The use of polyionic multifunctional quat primer polymers (quaternary ammonium compounds) allows for providing almost any surface with so many reactive groups that this can subsequently be provided with a virtually arbitrary functional layer.

Technology transfer

Technologie-Lizenz-Büro GmbH is responsible for the exploitation of this technology and assists companies in obtaining licenses.

Patent portfolio

EP 1710 283 B1 granted.

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