

Electron beam modification of polymers



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An electron beam is a very versatile tool for, amongst other things, treating the surfaces of materials. A wide range of modification and process variations are in particular available for polymeric materials.

Low-energy electrons are used here to sterilize, crosslink, or modify (functionalize) surfaces in other ways.

For example, altering the acceleration energy allows electron beams to penetrate into substrate materials to differing depth, and changing the energy dose (time and quantity) leads to different processes in the substrate.

The addition of reactive gases or reactive precursors and coupling with other coating methods such as physical vapor deposition (PVD) allows the deposition of covering layers and chemical modification of the surface.

Electron beam treatment of polymers is primarily used to improve adhesion to their surfaces. Optimal adhesion is particularly important in the printing industry when applying inks, when compounding polymer granulates, and when applying barrier layers to polymeric films for a wide variety of applications.

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Properties

The properties of the surfaces and interfaces of synthetic polymers and biopolymers can be purposefully modified by electron beam treatment. Modification of the following material properties is possible:

- Mechanical strength (hardness, strain, E-modulus, resistance to bending, impact toughness, melting index)
- Swelling and dissolution properties
- Surface topography (smooth, rough)
- Wetting properties
- Surface reactivity, via incorporation of chemically reactive groups or the grafting of reactive components
- Adhesion of organic coatings by co-crosslinking the layer and substrate

In addition, functional coatings can also change the material properties.

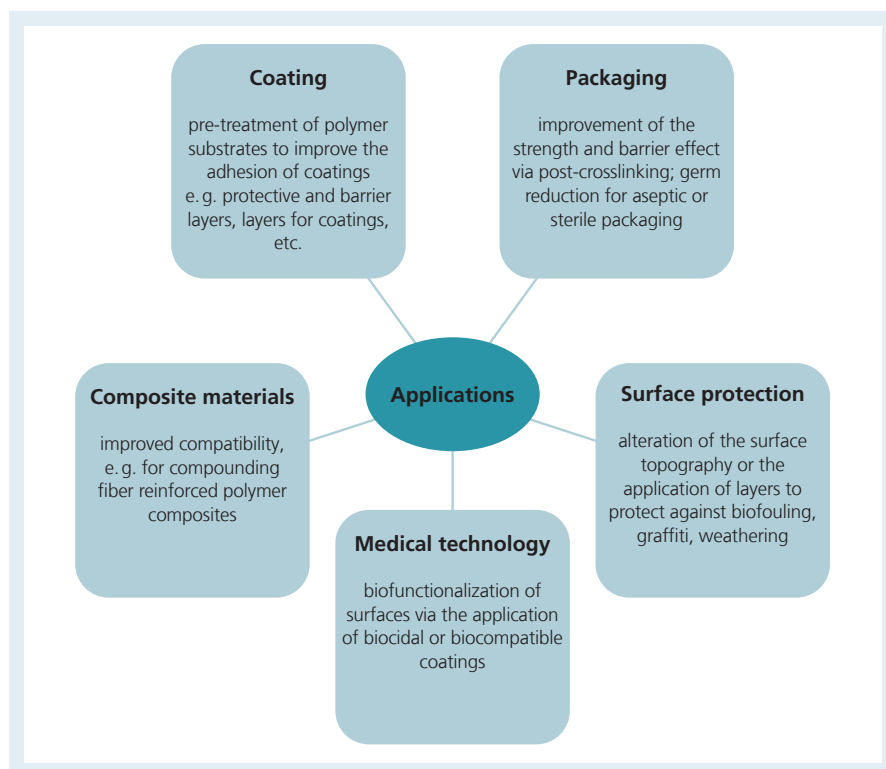
Technology

- Different low-energy electron beam sources (alternatively UV and plasma sources) for treating surfaces, including deep layer treatment
- High-energy electron beam sources (in collaboration with partners) for volume treatment of solid objects
- Option to carry out the process in air, in a protective gas atmosphere, or with reactive gases and reactive precursors (also possible under reduced ambient pressure)
- PVD/CVD coating with a wide range of materials also possible

Our offer

We offer:

- Complete technology development
- Selection of suitable electron beam sources and testing for your application
- Design and construction of specific system components
- Adaptation to and installation in new or existing production plants
- Identification of optimum process parameters
- Technical plant service
- Long-term collaboration for new or advanced development of products, or replacement of plant components
- Pilot trials on electron treatment of your specific substrates (alternatively UV or plasma treatment)
- Accompanying process and product analysis



Example applications