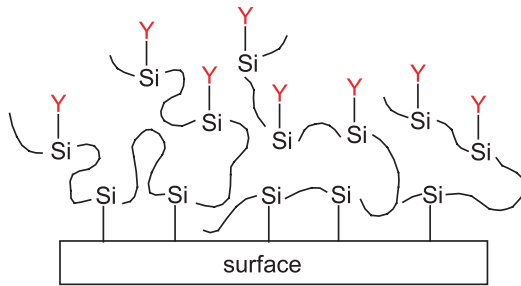


Polymer Materials

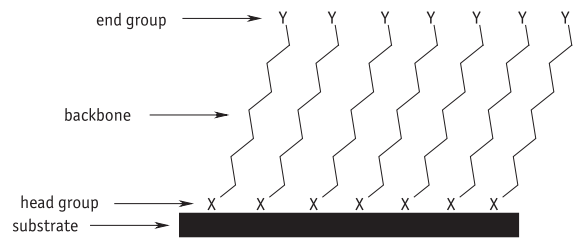
Polymers at Surfaces and Interfaces

Coatings

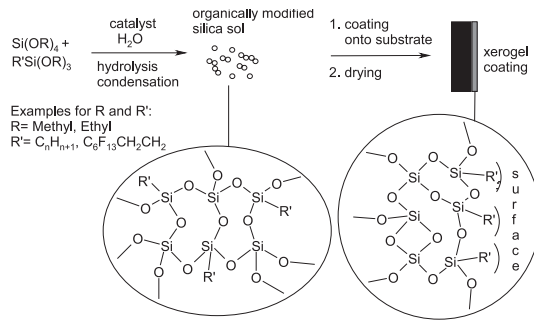
Polymeric nanocoatings



Self-assembled monolayers



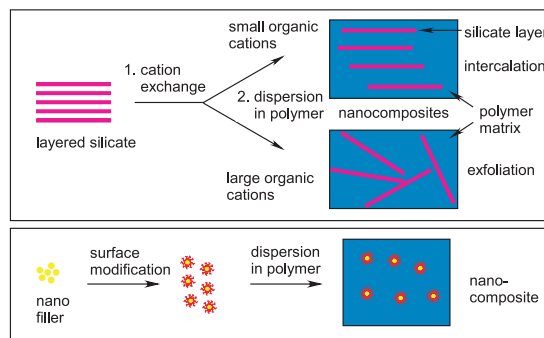
Sol-gel coatings



Applications

- Hydrophobic and oleophobic coatings with anti-adhesion and easy to clean properties
- Adhesion promotion layers
- Hydrophilic coatings
- Protective coatings
- Boundary lubrication layers
- Biocompatibility coatings
- Barrier coatings
- Smart coatings

Polymeric nanocomposites

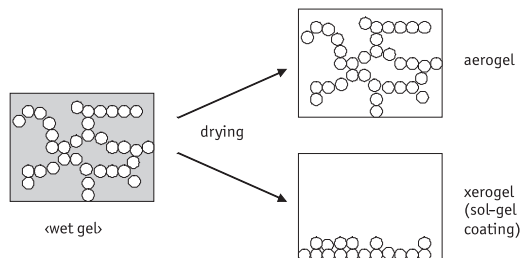


Nanosized fillers with a high specific surface area are modified to interact with the polymer matrix, since unmodified fillers often hardly disperse in polymers.

Applications

- Materials with improved mechanical properties
- Materials with improved optical properties
- Materials with improved electrical properties
- Barrier materials reducing gas permeation, e.g., in packaging

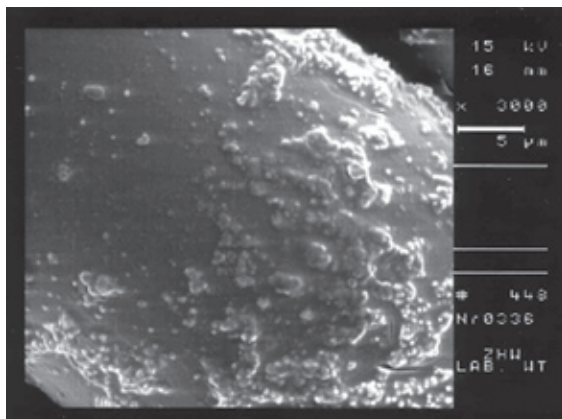
Aerogels



Properties

- Large open pores
- High inner surface area → catalyst support
- Low density (up to 95 % of their volume is air)
- Low thermal conductivity → isolating material
- Low sound velocity
- High optical transparency

Polymer blends



Partially miscible polymer blends are characterized by the occurrence of homogeneous or multi-phase micro- or nanostructures depending on the prevailing conditions of composition, temperature, pressure and flow. In the case of multi-phase micro- or nanostructures, the properties strongly depend on the interaction at the interface between the phases. A low degree of interaction can be overcome using compatibilizers.

Phase separation within a polymer blend may also be of advantage. The figure shows a scanning electron microscope (SEM) photograph of a superhydrophobic microphase-separated polymer blend coating with an advancing contact angle of water of 140° and easy to clean properties.

Infrastructure

The following infrastructure is available:

- **general analytics:** FTIR (including golden gate-technique, with data bank), NMR (DPX-300), UV/VIS
- **optimization of polymer synthesis:** reaction calorimeter RC1 and computer-controlled laboratory reactor LabMax® with ReactIR-Sonde
- **polymer analytics:** differential scanning calorimetry (DSC), thermo mechanical analysis (TMA), thermogravimetric analysis (TGA), gel permeation chromatography (GPC), molecular weight analyzer (light scattering DLS and SLS), pycnometer, melt flow indexer (MPI), rheometer, tensile-strength tester with constant-temperature chamber
- **polymer processing:** roll, press, extruder, micro compounder (7 ml) , mill
- **surface modification:** physical vapour deposition (PVD), plasma activation, spin-coating, fluidized-bed coating
- **surface characterization:** contact angle and surface tension measurement, X-ray photoelectron spectroscopy (XPS), FTIR at grazing incidence reflection (80°) with MCT detector, tensiometer, profilometer, scanning electron microscope (SEM), various microscopes, chamber for corrosion tests according to DIN-standards
- **particle characterization:** particle size analyzer (2nm-3µm), zeta potential analyzer, stability analyzer (analytical photo centrifuge)