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Polymer surface functionalization based on SO2 plasma treatments

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Plasmas generated by electrical discharges are efficient tools for the surface treatment of polymers. The efficiency, however, is usually accompanied by a multitude of reaction paths resulting in a complex mixture of products. For most of the activation type processes this complexity does not matter. But there have been many efforts for a more specific functionalization of surfaces. A number of different approaches have been applied. For example, the energy input per process gas molecule was reduced by pulsing the excitation power or special process gases were used which can undergo only a limited number of reaction paths. The application of sulfur dioxide plasmas is an example for the latter approach.
The treatment of a polymer surface with SO_2 plasma results in the formation of sulfur functional groups. The oxidation state of the sulfur in these groups ranges from thiols and sulfides to sulfates and hydrogen sulfates. The spectrum of these groups can be influenced by adding other gases to the process gas. The oxygen admixture in the SO_2 plasma produces exclusively the highly oxidized groups SO_3 (sulfonic acid, sulfonate) and SO_4 (sulfate). On the other hand, hydrogen in the process gas has a reducing function. In this case, sulfides and thiols are produce preferably.
Many of the functional groups formed in such treatments are quite reactive and can be used for further functionalization. Depending on the details of the process parameters, a surface can be prepared which can react with nucleophilic (e.g. amines) or with electrophilic (e.g. carboxylic acids) agents.
In the paper we will present examples of surface functionalizations starting with a treatment using SO_2 containing plasmas.

Keywords
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