Functional silicone elastomers via novel siloxane copolymers and chain extenders

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Oral abstract

Functional silicone elastomers via novel siloxane copolymers and chain extenders

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Functional silicone polymers and elastomers with altered/improved bulk and/or surface properties are highly desired to expand the application range even further. Novel functional silicone polymers and elastomers were prepared via two different methods. One method was through the synthesis of siloxane copolymers[1] (via the tris(pentafluorophenyl)borane catalysed Piers-Rubinsztajn reaction[2]), which allows for the attachment of functional molecules through copper-catalysed azide-alkyne 1,3-dipolar cycloaddition (CuAAC)[3]. The synthesised copolymers allow for a high degree of chemical freedom, as several parameters can be varied during the preparation phase. As an example, the space between the functional groups can be varied, by using different dimethylsiloxane spacer units between the functional molecules. Furthermore, the degree of functionalisation of the copolymers can be varied accurately by changing the feed of functional molecules. As a result, a completely tuneable elastomer system, with respect to functionalisation, is achieved. The second method of functionalising silicone elastomers involves the synthesis of a so-called 'chain extender' that allows for chemical modifications such as CuAAC. This route is promising as an easy-to-use additive to commercial RTV silicone elastomer systems. We have investigated how the different functionalisation variables affect elastomer properties including dielectric and viscoelastic properties.

[1]. Madsen, F. B. et al "Synthesis of telechelic vinyl/allyl functional siloxane copolymers with structural control *Polymer Chemistry*, 5, 7054-7061 , **2014**.
[2]. Rubinsztajn, S. and Cella, J. A., "A new polycondensation process for the preparation of polysiloxane copolymers" *Macromolecules*. 38, 1061–1063, **2005**.
[3]. Madsen, F. B. et al "Silicone elastomers with high dielectric permittivity and high dielectric breakdown strength based on dipolar copolymers *Polymer*, 55, 6212-6219, **2014**.