Heterogeneous bimodal condensation elastomers: an opportunity for many applications

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Recently many application areas, such as automotive, electric and electronics, fabric coatings and medical devices, highlight the employment of silicone elastomers due to the notoriety of their unique properties [1]. With this in mind, the importance of the development of functional polymers comes out on top in order to expand the application range of a given polymer [2].

PDMS elastomers are known for their high extensibility, high thermal stability, low surface tension and chemical and biochemical inertness. When two polymers with significantly different molecular weights are mixed together, the resulting network, so-called bimodal network, exhibits superior mechanical properties to traditional elastomers reinforced with fillers, namely high tear resistance, extensibility, ultimate strength and retard of rupture process [3].

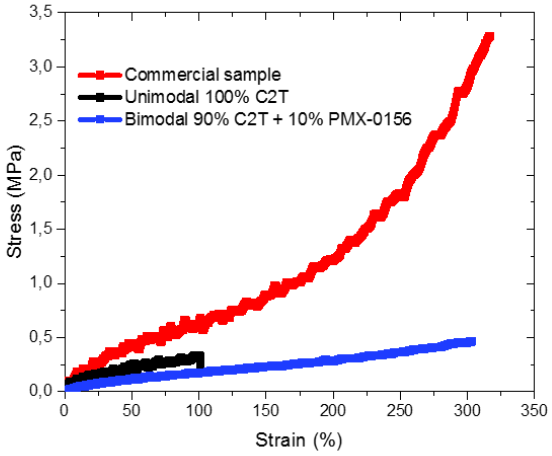

Figure 1: Stress-strain curves at room temperature and at strain rate of 0.01 s^{-1}

In this work, bimodal condensation-curing silicone elastomers were created as heavily cross-linked short PDMS chains joining long PDMS chains in two step procedure, in order to manufacture thin heterogeneous bimodal networks characterized by regions with high cross-linking density. The resulting elastomers were investigated with respect to rheology, tensile and tear strengths, as well as the curing conditions were optimized, taking into account the dependency of mechanical properties on the atmospheric humidity level.

References

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3. F. B. Madsen, A. E. Daugaard, C. Fleury, S. Hvilsted, A. L. Skov. Visualisation and characterisation of heterogeneous bimodal PDMS networks. *RSC Adv.*, **2014**, 6939-6945.