A new class of smart materials – two-phase glycerol-silicone hybrid elastomers

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A green and cheap silicone-based elastomer has been developed.[1,2] Through the simple mixing-in of biodiesel-originating glycerol into commercially available polydimethylsiloxane (PDMS) pre-polymer, a glycerol-in-silicone emulsion was produced. This counterintuitively stable mixture became a basis for obtaining elastomeric composites with uniformly distributed glycerol droplets. Various compositions, containing from 0 to 140 parts of glycerol per 100 parts of PDMS rubber by weight, were prepared and investigated in terms of mechanical properties as well as optical and scanning electron microscopy (examples in Figure 1). The materials were proven additionally to exhibit a strong affinity to water, which was investigated by simple water absorption tests. Incorporating glycerol into PDMS decreased the Young's modulus of the composites yet the ultimate strain of the elastomer was not compromised, even in the presence of very high loadings. The conducted experiments highlight the great potential of this new type of elastomer and reveal some possible applications especially in biomedical industry where controlled and tunable drug delivery is one of the requirements. This hybrid material was also adopted to produce glycerol-silicone elastomeric foams with adjustable densities, morphologies and mechanical properties creating a new platform for drug delivery devices.

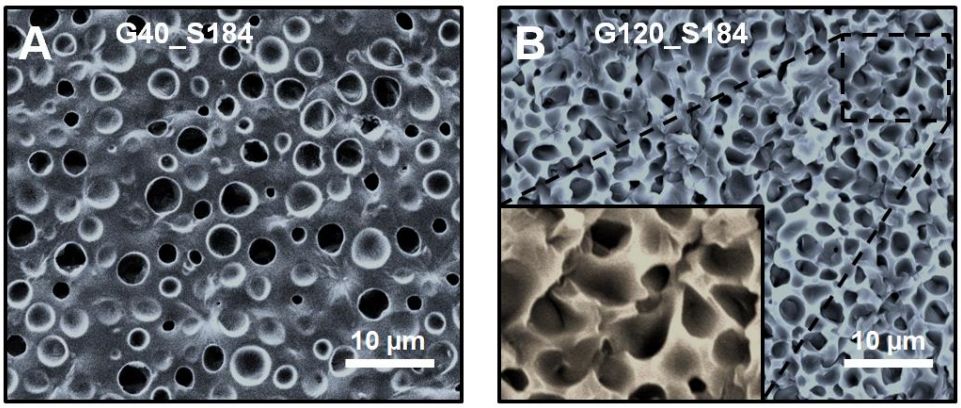

Figure 1. SEM images of composites representing discrete glycerol droplet morphology (A) and bicontinuous morphology (B) with interconnections present between the adjacent glycerol domains as illustrated in the enlarged picture in inset.

References:

1 P. Mazurek, S. Hvilsted and A. L. Skov, *Polymer*, 2016, **87**, 1–7.

2 P. Mazurek, L. Yu, R. Gerhard, W. Wirges and A. L. Skov, *J. Appl. Polym. Sci.*, 2016, **44153**, 1–8.