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MATERIALWISSENSCHAFTLICHES KOLLOQUIUM

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Nanofibre and multi-walled carbon nanotube (MWCNT) filled silicone elastomer composites with large strain and toughness enhancement

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Abstract:

The possibilities for the reinforcement and/or toughening of silicone elastomers with the use of electrospun fibres based on poly(dimethylsiloxane) copolymers will be discussed. The novel copolymers synthesized provide the necessary compatibility of the nanofibres with the silicone matrix and allow for the inclusion of multi-walled carbon nanotubes (MWCNT) in the elastomer matrix. All of these copolymers have phase segregated morphologies and the morphology of the electrospun fibres and inclusion of the MWCNT's in this complex morphology is discussed. Several different copolymers and methods for the preparation of the composites will also be discussed. This includes options for the production of composite materials with aligned nanofibres and the use of aligned carbon nanotubes in the fibres. The electrospun fibres show a remarkably good distribution in the silicone matrix. The mechanical properties of the composites show dramatic improvements relative to the unfilled silicone elastomer particular with regards to strain and toughness. Finally the potential application of the MWCNT fibres for the preparation of fully flexible conductive silicone composites is discussed.

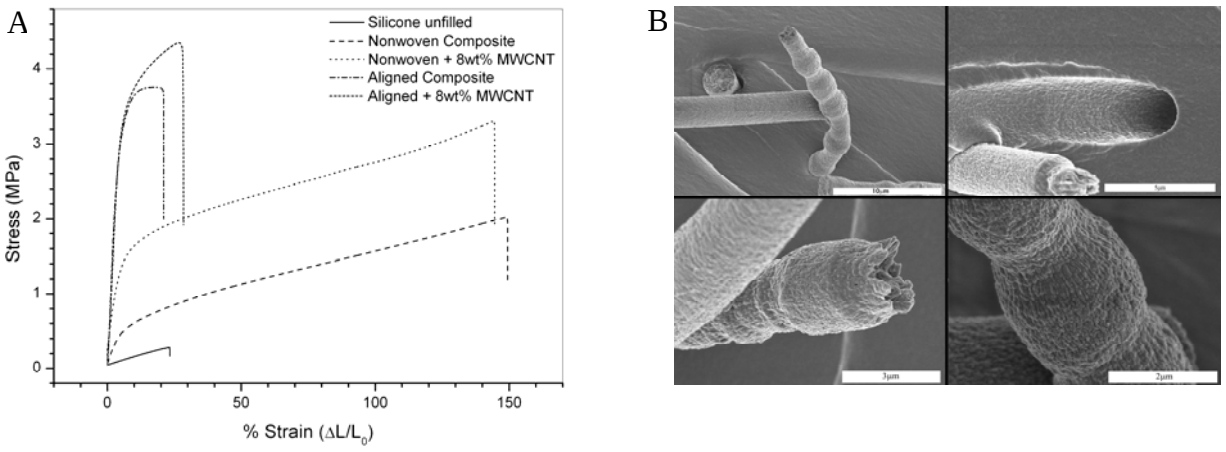

Figure 1: Stress-strain curves (A) for the various silicone composites and SEM images (B) of the composite fracture surface showing fibre pullout and yielding.

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