Accepted Manuscript

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PII: S0266-3538(17)33053-1

DOI: 10.1016/j.compscitech.2018.06.004

Reference: CSTE 7260

To appear in: *Composites Science and Technology*

Received Date: 30 November 2017

Revised Date: 20 April 2018

Accepted Date: 5 June 2018

Please cite this article as: Qiu M, Wu S, Tang Z, Guo B, Exchangeable interfacial crosslinks towards mechanically robust elastomer/carbon nanotubes vitrimers, *Composites Science and Technology* (2018), doi: 10.1016/j.compscitech.2018.06.004.

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Exchangeable Interfacial Crosslinks towards Mechanically Robust Elastomer/Carbon Nanotubes Vitrimers

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Abstract: Covalent bonds mediated interfaces are generally favorable for transferring interfacial stress and hence rationalizing the mechanical properties of the filled elastomeric composites. Aiming at reprocessable yet robust elastomeric composites, in this contribution, exchangeable interfacial crosslinks are introduced into the interfaces between epoxidized natural rubber (ENR) and multi-walled carbon nanotubes (MWCNTs). This is accomplished by functionalizing MWCNTs with carboxyl groups through diazo-coupling reaction and then incorporating the modified MWCNTs into diacid-cured ENR. Accordingly, covalent *β*-hydroxy ester bonds result in the interfaces between ENR and MWCNTs. The formation of covalent interfaces enables much uniform dispersion of MWCNTs and stronger interfacial adhesion. Comparing to the ENR filled with pristine MWCNTs, the modified composites exhibit much improved mechanical performance. Importantly, the exchangeable nature of interfacial *β*-hydroxy ester bonds has promoted effect on the reprocessibility of epoxy-MWCNTs vitrimers. Overall, we envision this interfacial strategy can provide an alternative avenue towards reprocessable yet robust elastomeric composites.

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