

Editorial corner – a personal view

Interphase engineering in polymer composites: Challenging the devil...

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The aphorism ‘God made the bulk; surfaces were invented by the devil’ is credited to Wolfgang Pauli, Nobel Prize in Physics in 1945. The interphase is a key issue for polymer composites since it guarantees the necessary stress transfer from the ‘weak’ matrix to the ‘strong’ reinforcement. Since the interphase is the key factor of composite performance, its engineering design is being under spot of interest from both academia and industry. New impetus to interphase engineering was provided by the worldwide extensive research on polymer nanocomposites. The mechanical properties of this new generation of materials did not fully meet the expectations, which might have been exaggerated as far as the replacement of traditional reinforcements by nanoadditives is concerned.

However, nanofillers and nanocomposites have recently attracted great interests as potential solutions to some acute problems with composites’ interphase. Among these problems the detection of failure/damage, their eventual healing, poor out-of-plane performance including low delamination resistance and inherently missing properties should be mentioned. Failure/damage start at the interface or in the interphase. Therefore, creating a ‘smart’ interphase the properties (e.g. electrical conductivity, piezoresistivity...) of which change with progressing damage would allow a structural health monitoring (DOI: [10.1016/j.carbon.2012.04.008](https://doi.org/10.1016/j.carbon.2012.04.008)). The load bearing of traditional fibers can be promi-

nently improved when nanoscaled additives (nanotube, graphene, clay...) are deposited on their surfaces by suitable manners. The related ‘hierarchical’ fibers enhance the delamination resistance, support a more homogenous stress distribution and improve other out-of-plane properties. The encapsulation strategy of healing agent was successfully adapted for the interphase by creating and depositing submicron-size capsules onto the fiber surface (DOI: [10.1016/j.compscitech.2013.02.007](https://doi.org/10.1016/j.compscitech.2013.02.007)).

Most of the above concepts, well summarized in recent reviews (DOI: [10.1016/j.pmatsci.2015.02.003](https://doi.org/10.1016/j.pmatsci.2015.02.003) and DOI: [10.1016/j.compscitech.2014.07.005](https://doi.org/10.1016/j.compscitech.2014.07.005)), have been conceptually proved at a laboratory level and need to be up-scaled to in industrial praxis. New strategies to overcome deficiencies with polymer composites are still needed. However, the interphase engineering is not yet finished (the devil has his fingers still there...) – why not to play in this exciting research arena?



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