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Dynamic adhesion of rubber-metal interfaces

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New testing methods for failure analysis of rubber-metal composites during cyclic loading

Rubber-metal composites are used in several applications that require bearing relatively high loadings while maintaining a significant degree of deformation. A critical aspect related to their service life is the adhesion between elastomer and metal. The final performance of the composites depends on several production parameters related to both the curing of the rubber and the bonding between the macromolecular chains and the metal substrate.

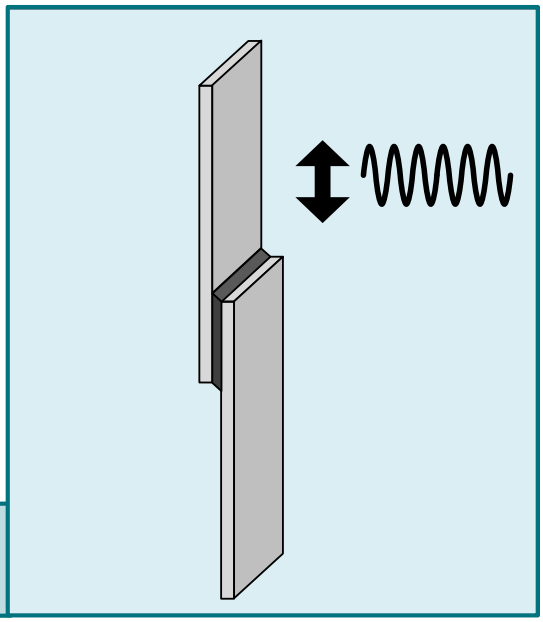
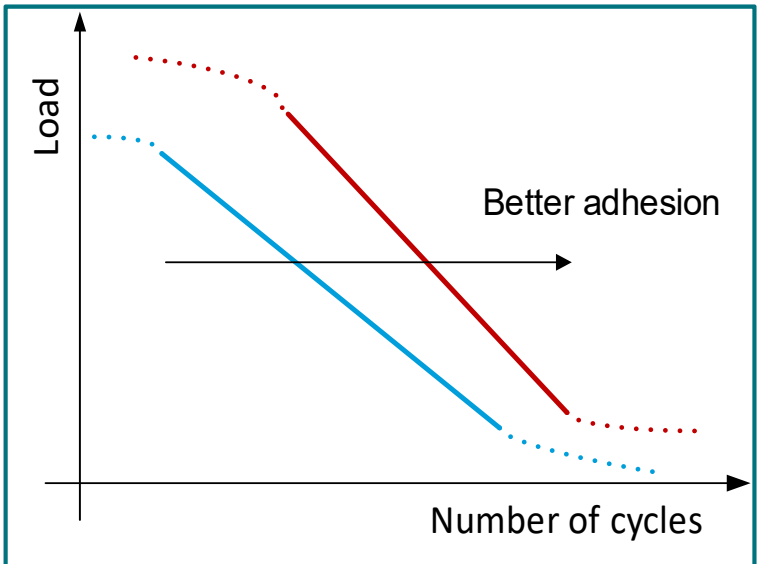


Fig.1

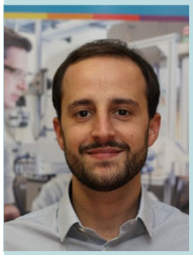
Lap-shear geometry in which an elastomer layer bonds two metal plates allowing the assessment of adhesion through static and dynamic shear loads.



Elastomer-based components are often subjected to large static loads on which small cyclic loading are superimposed and their failure is often related to cyclic loading conditions. This requires evaluation of the dynamic adhesion of rubber-metal interfaces. For this purpose, a novel approach was chosen by utilizing lap-shear geometry (Figure 1). By exploiting cyclic tests at different load levels, the chosen geometry allows to rank different composites based on their dynamic adhesion properties (Figure 2). This will allow the optimization of materials and processing conditions for the production of more reliable elastomer-based composites.

Fig. 2

Wöhler curves based on the dynamic adhesion properties of rubber metal interfaces. Better adhesion and better performances are connected to materials displaying curves at larger number of cycles.



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