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Smart Adhesive Joints

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Adhesive-bonded joints are increasingly being used in aerospace and automotive industries. The use of adhesive bonding rather than mechanical fasteners offers the potential for reduced weight and cost [1,2]. However, the adhesives are exposed to a wide range of service loading conditions, such as thermal cycling in space environment, creep and fatigue imposed by structural joint configurations, and residual stress due to mismatch of thermal expansion between adhesive and substrates. All these service loading conditions are the cause of damage in adhesives limiting its structural performance and other functional characteristics. Therefore, adhesives with self-healing capability to suppress service-induced damage and cracking in particular provide a promising potential in extending the service life of bonded joints. This paper presents an overview of the recent developments in the field of self-healing materials, focused on their applications to adhesive bonding joints.

[1] M.D. Banea, L.F.M. da Silva, Adhesively bonded joints in composite materials: An overview, Proceedings of the Institution of Mechanical Engineers, Part L: Journal of Materials: Design and Applications, 223 1 (2009).

[2] L.F.M. da Silva, A. Öchsner, R.D. Adams (Eds.), Handbook of Adhesion Technology, (Springer, Heidelberg, 2011).