

Self-Healing in Metal-Based Systems

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Self-healing technologies in metals have a great potential to improve structures reliability and sustainability in particular in the construction sector. However, limited technologies are available compared to other self-healing material groups and they struggle to find industrial applications. The main limitation for self-healing strategies in metals is the low mobility of atoms at room temperature and often the need for an external driving force to promote mass transfer. This chapter provides a review of all currently developed self-healing concepts in metallic systems classified by their scale and healing process category as: macroscopic systems (including liquid-based systems, shape memory alloys and electro-healing) and solid-state healing of nano and microscale damage. A summary of all strategies is provided and a comprehensive analysis of their advantages and challenges is introduced. Finally, further perspectives of self-healing strategies are discussed and critical points interrupting further development of the existing self-healing materials are highlighted.