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Influence of Nanomaterials on the Properties of Shape Memory Polymeric Materials

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Abstract : The use of nanomaterials in the formulation of polymeric materials modifies their molecular structure, offering an infinite range of possibilities for the development of smart products, being of great importance for science and contemporary industry. Shape memory polymers are generally lightweight, have high shape recovery capabilities, they are easy to process and have properties that can be adapted for a variety of applications. Shape memory materials are active materials that have attracted attention due to their superior damping properties when compared to conventional structural materials. The development of methodologies capable of preparing new materials, which use graphene in their structure, represents technological innovation that transforms low-cost products into advanced materials with high added value. To obtain an improvement in the shape memory effect (SME) of polymeric materials, it is possible to use graphene in its composition containing low concentration by mass of graphene nanoplatelets (GNP), graphene oxide (GO) or other functionalized graphene, via different mixture process. As a result, there was an improvement in the SME, regarding the increase in the values of maximum strain. In addition, the use of graphene contributes to obtaining nanocomposites with superior electrical properties, greater crystallinity, as well as resistance to material degradation. The methodology used in the research is Systematic Review, scientific investigation, gathering relevant studies on influence of nanomaterials on the properties of shape memory polymeric, using the literature database as a source and study methods. In the present study, a systematic reviewwas performed of all papers published from 2014 to 2022 regarding graphene and shape memory polymeric througha search of three databases. This study allows for easy identification of themost relevant fields of study with respect to graphene and shape memory polymeric, as well as the main gaps to beexplored in the literature. The addition of graphene showed improvements in obtaining higher values of maximum deformation of the material, attributed to a possible slip between stacked or agglomerated nanostructures, as well as an increase in stiffness due to the increase in the degree of phase separation that results in a greater amount physical cross-links, referring to the formation of shortrange rigid domains.

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