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Generation of Smart Structures on the Basis of in-situ Configuration of Shape Memory Alloys

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Abstract

An outstanding feature of shape memory alloys (SMAs) is their potential to produce different functional effects like thermal shape memory or superelasticity in one component. The purpose of the present study is to find a way to create a universal component with properties adjustable for various applications solely by modifying the local material properties. We refer to this process as in-situ configuration. The basis of in-situ configuration of the materials' properties is generated by first deactivating the shape memory effect in the whole element and then local activation of the shape memory effect by use of local heat treatment. The NiTi-elements presented in this study offer various options, since they do not feature perceptible thermal shape memory or superelasticity due to a high dislocation density. Instead, to achieve a specific local function, the elements are subjected to in-situ heat treatment carried out by a local resistive heating element. There is a need to adjust the duration and intensity of the heat input in order to obtain different functional properties.