

REACTIVE NANOSCALED MULTILAYERS FOR HIGH-PRECISION JOINING

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Classical joining techniques like welding, soldering or brazing typically are characterized by a large amount of heat input into the components. However in the case of heat sensitive structures like MEMS this often results in stress induced deformation and degradation or even in damaging the parts. So-called reactive nanometer multilayers offer a promising approach to avoid these undesirable effects.

Reactive nanometer multilayers consist of several hundreds or thousands of alternating nanoscaled layers, which can react with each other. Placing a reactive nanometer multilayer between two surfaces already applied with a solder or brazing metal, it can be used as a controllable local heat source. After activating the chemical reaction by an electrical spark, laser pulse or impact, a self-sustaining intermixing reaction starts, which travels the length of the reactive nanometer multilayer resulting in a stable intermetallic material, such as NiAl. The peak temperature of the reaction can be well above 1000 °C, but it only reaches this temperature for milliseconds, so that the heat is localized to the solder layers. The component remains at room temperature during the entire process.

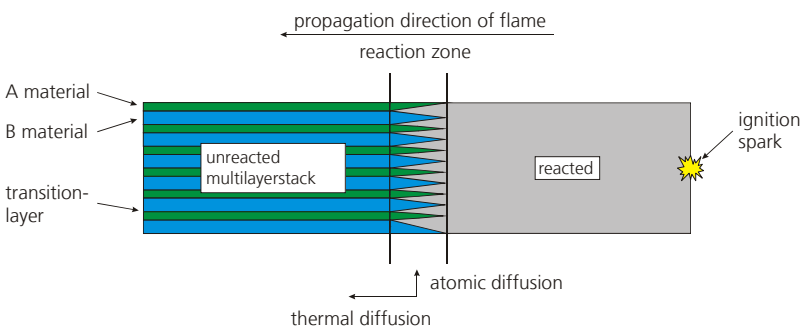


Fig. 1: principle of a reactive nanometer multilayer



Fig. 2: free-standing Ni/Al-RMS

REFERENCES

1. Dietrich G. et al. *Vakuum in Forschung und Praxis* **21**, 15-21, 2009.