

Abstract for EXTREMAT Training activity

***Rapid hot pressing as a cost efficient method for the manufacturing of diamond based composites for electronic's cooling.***

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The continuous increasing demand of electronic's industry for advanced materials with improved cooling efficiency requires new material solutions. Diamond based composites are a promising solution to combine material properties such as high thermal conductivities (>400 W/mK) with tailored Coefficient of Thermal Expansion (below 10 ppm/K).

To achieve these material properties a metallic matrix must be reinforced with a diamond volume fraction of 50% or more. Of course such a high diamond loading can be connected to high raw material costs – depending on the quality of the used diamond filler. To compensate these partially high raw material costs a cost efficient rapid manufacturing is used. Direct heated hot pressing or inductively hot pressing is used to manufacture these composite materials in a short cycle time. The cycle times for the manufacturing of Al-diamond and Cu-diamond composites are typically below one hour.

Additionally these pressure assisted methods allow to a certain degree a near net shape fabrication of metal-diamond composites and therefore to avoid expensive machining costs or costs for the post processing of the material. Plates with perfect surface finish or plates including inserts (unreinforced areas) which allow to machine holes or threads are possible by using this process.

Results of thermophysical properties of Al-diamond and Cu-diamond composites will be presented as well as examples of possible size and shapes which have already been realized will be given. A first assessment of possible costs for the manufacturing of these composite materials will be made.