THERMACO

Smart Thermal conductive Al MMCs by casting

Integrating thermal highways into cast Aluminium parts. A technological breakthrough and a change of concept in every heat management application.

www.thermaco.eu

State of the art:

- Rising demand for heat evacuation in many applications
- Carbon-based materials achieve high thermal conductivity, however only at low structural stability and difficult machinability

Aim & Impact:

- Efficient solutions for heat evacuation applications
- Combination of carbon-based materials with metal matrix
- Introduction of completely new, integrated product designs for heat evacuation

Implemented project results as of now:

- Material and design development for thermal highways (fig. 1, fig. 2 and fig. 3)
- Development of design guidelines for surface structuring for optimised heat dissipation
- Thermal simulation for heat dissipation through insert and base material and experimental verification
- Development of casting technologies for production of Al-MMC with integrated Graphene-based insert
- Development of specially adapted manufacturing and finish machining technologies (fig. 4 and fig. 5)
- Design and realization of application relevant demonstrators (fig. 6 and fig. 7)
- Life cycle analyses and environmental impact assessment

Further steps:

- Combination of copper with graphene-based materials

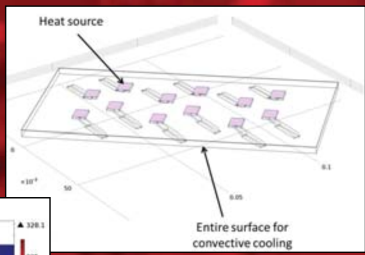

Fig. 1:
Model for the simulation of heat transfer in a baseplate with Graphene-based inserts for electronic cooling.

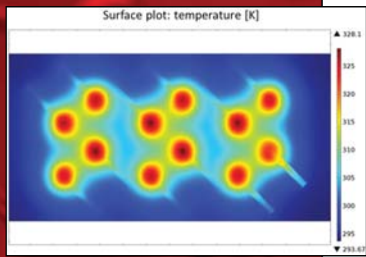

Fig. 2:
Simulation result of a baseplate with Graphene-based inserts for electronic cooling.

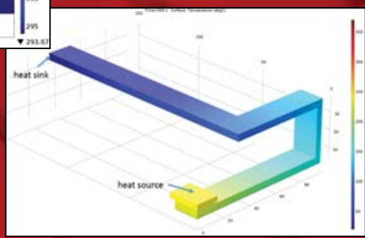

Fig. 3:
Result of transient heat transfer simulation through complex shaped part with anisotropic thermal conductivity.

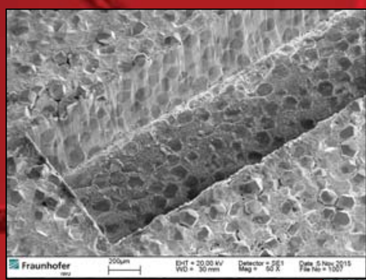

Fig. 4:
Laser machined channel in aluminium reinforced by monocrystalline diamonds.

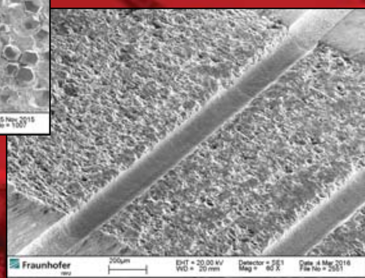

Fig. 5:
Aluminium with highly oriented pyrolytic graphite inserts machined with EDM.

Fig. 6:
Demonstrator for automotive application. The black material is the “thermal highway” insert.

Fig. 7:
Demonstrator for cooling of electronic devices.

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