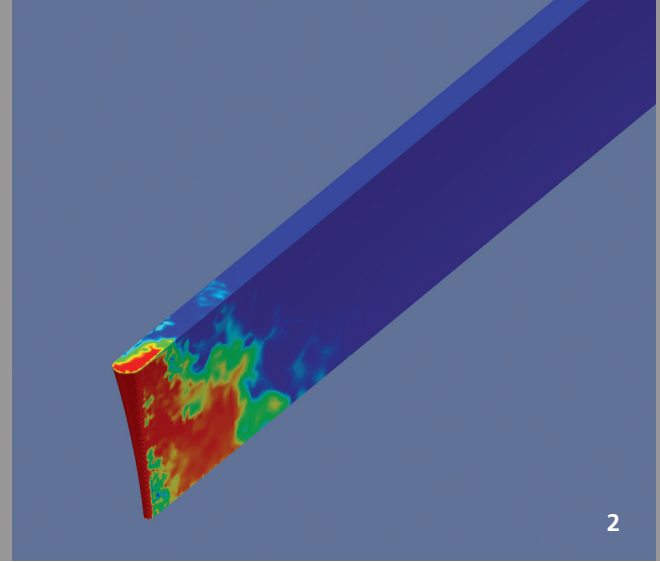


1



2

CLEAN LASER CUTTING OF PRINTED CIRCUIT BOARDS

Task

Printed circuit boards essentially consist of hardened epoxy resins and embedded glass fiber that combine to create a mesh. Decomposition products tend to be deposited on the blanks and on the cut edges whenever printed circuit boards are cut using laser radiation.

Method

Since these depositions impair quality, they should be prevented. In order to do this, a model is required that describes the decomposition and optimizes the flow of decomposition products by suitably designing the cutting gas flow.

Result

A Discontinuous Galerkin method for calculating the three-dimensional flow of gas mixtures in a complex geometry was implemented. The decomposition was described by means of a model that takes into account experimentally determined deposition rates and the key decomposition channels. For the cutting processes investigated to date, the depositions that impair quality were almost entirely prevented by means of multi-chamber nozzles and a suitable design of the cutting gas flow.

Applications

The presented simulation enables the gas flow to be calculated taking into account the decomposition/vaporization of materials. It can be used for machining processes where the design of a gas flow assures quality.

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Mass fraction of the ablated material in the kerf for an unmodified cutting gas flow (Fig. 1) and for a modified cutting gas flow (Fig. 2).