Joining by laser induced shock waves of aluminum and plastics

S. Veenaas[1, a)] and F. Vollertsen[2, b)]

[1]*Bremer Institut für angewandte Strahltechnik GmbH, Klagenfurter Str. 5, 28359 Bremen, Germany*
[2]*Bremer Institut für angewandte Strahltechnik and University of Bremen, 28359 Bremen, Germany*

[a)]*Corresponding author: veenaas@bias.de*
[b)]*mbs-info@bias.de*

Abstract.

The material diversity in micro products is increasing and against this background, the assembly of micro components is one of the major challenges. It is necessary to implement new joining technologies, which are capable of joining different material combinations. Laser shock joining is a novel mechanical joining process. This process is based on a forming process using TEA-CO_2-laser induced shock waves. The laser irradiates directly on the forming sheet and creates a shock wave above the surface. The pressure of the shock wave leads to a forming of the sheet material. The material is formed into the joining area and creates an undercut which presents the joint. The form closure between the two materials enables a joint compared to conventional clinching processes. So far, investigations were performed to identify the process window and the joining strength for aluminum / steel joints and aluminum / glass joints. One of the most used material category in micro products are plastics. Thus, in this study the suitability of joining aluminum with plastics is investigated. The design of the joining process for the geometrical characteristics of the joining tool is explained. The geometrical process window is described and the suitability of this joining process for the micro range is shown.