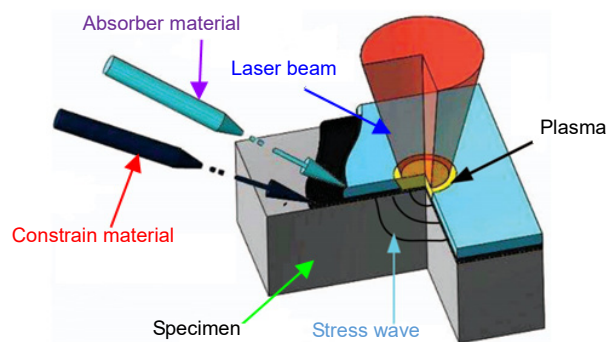


# The application status and development of laser shock processing

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The schematics of laser shock processing

**Overview:** The fatigue properties of metal components are related to their surface integrity closely. In general, the components' fatigue fracture, especially the high-cycle fatigue fracture is often due to the surface cracks, and the gradual expansion of the crack may leads to the overall destruction. In order to improve the structural reliability and extend the fatigue life without changing the properties of the matrix material, the surface strengthening technology has got more and more research and application internationally. Common surface strengthening techniques include shot peening, surface rolling, forging and extrusion, etc. Shot peening is a surface technology that uses the high-speed projectile to hit the material surface, which can produce Strain hardening layer and cause residual compressive stress in the surface. The compressive stress can cancel part of the working load (tensile stress), thereby enhancing the fatigue strength of the parts. Surface rolling can apply a certain amount of pressure to the surface of material by the rolling tools, and the local slight plastic deformation would occur in the surface of material, and improve the surface roughness and uniform the stress field distribution. Certainly, the technology of forging and the extrusion can introduce a certain amount of pressure in the surface of materials, and it can improve the mechanical properties and service life of materials too. With the development of high-end equipment such as aerospace, weapons, nuclear energy and transportation, the surface requirements of parts are becoming higher and higher. The traditional strengthening technique such as shot peening and surface rolling will difficult to meet the production requirements of high-performance equipment gradually. But the laser shock processing can solve these problems well. Laser shock processing is a new surface strengthening technology that can improve the fatigue life of materials by using laser-induced plasma shock waves. It has the advantages of significant strengthening effect, strong controllability and good adaptability. Laser shock processing plays an important role in improving the structural reliability, the fatigue strength of parts and the service life of materials. In recent years, laser shock processing has received widespread attention and developed rapidly. This paper briefly introduces the basic principle, characteristics and application fields of laser shock processing, and summarizes the development and research results of laser shock processing. In view of the current situation of laser shock processing at home and abroad, some problems of the technology that need to be solved now are put forward. Finally, the application prospect of laser shock processing is forecasted.

**Citation:** Wu J J, Zhao J B, Qiao H C, *et al.* The application status and development of laser shock processing[J]. *Opto-Electronic Engineering*, 2018, **45**(2): 170690

Supported by National Natural Science Foundation of China (51501219), National Key Development Program (2016YFB1102704), NSFC-Liaoning Province United Foundation (U1608259) and National Natural Science Foundation of Liaoning Province (2015020115)

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