Weld joints are characterized by significant changes of structure, physical properties and, in particular, elemental composition of welded substances in processing zones. The type of components redistribution depends on welded materials and welding modes. Variation of impurities, in turn, influences physical, mechanical and operational properties of materials.

The laser-induced breakdown spectroscopy (LIBS) study of steel weld joints was carried out. Connections of the rods were made with electric-arc welding by angle way in the inside of the butt joint. The rods of different diameters and three types of low-carbon steel were welded with oxygen and acetylene feed of air. The main purpose of the research was the determination of difference of elemental composition of acetylene and non-acetylene joints.

After determining the composition of the starting materials changes in the zones of the weld was identified. The content of manganese, copper and chromium from the center line of the joint and from the boundary was considered. Sampling was carried out from the lateral cut.

In Fig. 1a and 1b the dependence of the distribution of copper and manganese on the distance from the center of the weld joint is shown: without acetylene (Fig. 1a) and with acetylene (Fig. 1b)

In the case of non-acetylene welding enrichment of the central zone is observed. This distribution is similar to that considered in the first phase for the laser welding of homogeneous steel [1]. For copper enrichment is observed throughout the whole joint; for manganese only the central area is enriched - on the border of the joint the content is aligned with the initial. The boundary of "liquid phase - solid material" depleted impurities as in the case of laser welding.

The opposite pattern is observed when using acetylene. The central part is strongly depleted in manganese and copper, the boundary is clearly oversaturated. And in this case, the whole joint is enriched with copper and depleted with manganese.

The considered distribution suggests that the acetylene joints, although recognized as a high quality and a high-speed welding, have a central part of the joint more exposed to external influences such as shock loads and variable temperature due to depletion of manganese.

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REFERENCES