Abstract

This research (degree work) is dedicated to consideration of a new method for residual stress diagnostics and evaluation in weldment constructions using laser excitated Surface Acoustic Waves (SAW).

Theoretical model of laser excitation and SAW propagation in materials under stress is described. Several ways of SAW registration and processing are proposed.

Created experimental setup yielded such results as:

1) Angular SAW's speed distribution in unstressed pattern.
2) Dispersion and SAW attenuation in various samples. Ability to compare relative changes of group and phase velocities.
3) Surface distribution of SAW's relative speed changes for further stress evaluation.

An algorithm for residual stress evaluation using relative speed changes is described and several advantages of new method are shown. Ability to carry out local one-sided measurements, possibility to evaluate separately both stress components (thus solving anisotropy problem) makes proposed method applicable for further industrial use.