Study using acoustic waves state of metal alloys after diffusion influences with the aim of predicting their behavior

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Metallic materials commonly used in practical applications objects. Their state plays a leading role in the process of operation. On the condition of the materials is influenced by various external influences. Such influences manifested in the process of manufacture and in the operation should be attributed primarily to processes of diffusion. They substantially change the physical parameters of the surface layers. Therefore, the actual task of assessment of health products and predicting their behavior. For solving this task was proposed to monitor the status of materials by means of acoustic waves (AW), i.e., to use AMD-methods [1,2]. GHz- range was chosen to ensure a sufficiently high resolution.

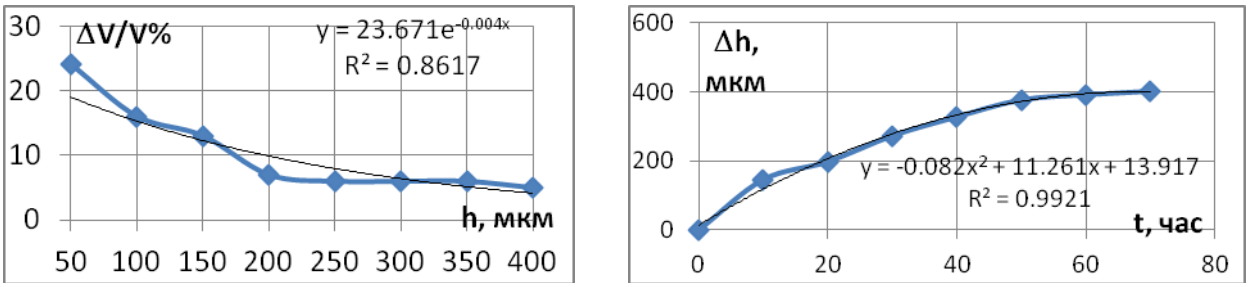

Fig. 1. *a*) the dependence of the absorption level of AW in the surface layers of steel (38XMIOA) depth of nitriding layer (t^0 process 560^0C); *b*) the dependence of the thickness of the layer with altered properties from the time of nitriding (at $t^0 = 500^0$C) obtained by the change of speed υ_R of surface acoustic waves in steel (40XHMA).

The essence of the work was to develop methods for studying the state of the materials and in the assessment of the level of exposure of diffusion processes using the AMD methods. The objects of the study - model materials, and steel of various types. It is experimentally shown that AMD-methods sensitive to diffusion effects. For example, the processes of carburizing and nitriding of steels demonstrates the dependence of the number of characteristics of acoustic waves (AW) from the parameters of diffusion processes. These settings include, first, the concentration of a substance- diffusion, temperature and time of process. In Fig.1 shows examples of the dependence of the absorption level of AW in the surface layers of steel from the depth of the nitriding layer and the dependence of the

thickness of the layer with altered properties from the time of nitriding obtained by the change of speed υ_R of surface acoustic waves in steel .

The experiments confirm the high sensitivity of AMD-methods as parameters of the diffusion processes and their changes [3]. This fact allows to monitor the processes of diffusion, to control the structure of materials, identify and characterize system defects (e.g., microcracks, pitting, etc.).

References

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