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Lisovska M.*National Aviation University, Kyiv***FOIL SENSOR FOR STRUCTURAL HEALTH MONITORING SYSTEMS**

Structural Health Monitoring Systems (SHMS) allow monitoring fatigue of aircraft as well as oil pipes, oil and fuel tanks, ships, bridges, etc.

The key component of SHMS is a sensor, installed on a part, subjected to operational loads. The wide spectrum of sensors has already been developed. Nevertheless, a variety of loading and environmental conditions, constructional materials, service life goals require new and more sophisticated approaches to the problem of fatigue damage diagnostic and fatigue quantitative assessment.

A family of fatigue damage sensors has been developed at the National Aviation University.

The first one was the single-crystal fatigue damage indicator [1]. The quantitative parameter of the accumulated fatigue damage in this concept is the density of the slip lines on the single-crystal surface.

The tests conducted with single crystal sensor have shown the close linear relationship between the density of slip lines and number of cycles. However, the process of single crystal sensor manufacturing is rather difficult and expensive. Thus, the idea of polycrystalline fatigue sensor development has appeared.

Foil polycrystalline fatigue sensor is made of foil aluminum alloy AD-1[2]. The search for the methods to provide required defined sensitivity of the indicator has led to the experiments with foils annealing. As a visible result of annealing the grain size has been significantly increased. The foil sensors have been tested on the standard fatigue test machine under the different cyclic loading regimes. Selection of the testing regimes is based on the stress analysis of the structures that need fatigue monitoring.

Sensor surface state during the loading was monitored by the computer aided light microscopy. New parameters of the fatigue damage proposed at the National Aviation University [3] were used.

Conducted experiments have proved the applicability of the new generation of fatigue sensors for SHMS of different structures, first of all aircraft.

References

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