

Piezoceramics in Sheet-Metal Compounds for Icing Detection

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ABSTRACT

Icing detection and de-icing techniques play an important role to assure a safe operation of airplanes and wind turbines [1,2]. Integration of piezoceramics in structural parts allow for additional functionalities like health monitoring, impact detection and even to solve icing problems. The paper deals with innovative sheet-metal compounds, consisting of a piezomodule in a layer of adhesive embedded between two aluminum sheets. A prototype of a demonstrative wing structure with integrated piezomodules is used for icing detection. A special production and forming technology was presented in earlier studies, where forming takes place in a viscous condition of adhesive. This concept allows for a forming of brittle piezoceramic fibers inside the compound. A demonstrative wing structure was built with this production technology. The integrated sensor is used for a detection of additional local masses. Aim is the implementation for aerodynamic icing detection and a vibration assisted de-icing. Within the paper preliminary tests for an icing detection are described. Therefore impedance and loss angle of an integrated piezomodule are measured for a broad frequency range under variation of additional masses and temperature. Icing was performed inside a cold chamber at -40 °C. It is shown that the impedance is significantly influenced by additional masses at room temperature, by a reduction of temperature without additional masses and by additional masses (ice) at reduced temperatures. The results imply that the assumptions are correct and the continuative investigations are worthwhile to potentially develop an icing detection technology.

REFERENCES

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