Spectroscopic Characterization of Innovative Aviation Materials

M. T. Caccamo[1*], G. Castorina[2], F. Colombo[2,3] and S. Magazù[2]

[1]*Consiglio Nazionale delle Ricerche (CNR) – Istituto per i Processi Chimco – Fisici (IPCF), Viale F. Stagno D'Alcontres 37, 98158 Messina, Italy.*

[2]*Dipartimento di Scienze Matematiche e Informatiche, Scienze Fisiche e Scienze della Terra, Università di Messina, Viale F. S. D'Alcontres 31, 98166 Messina, Italy*

[3]*Servizio Meteorologico dell'Aeronautica Militare, Comando Aeroporto – Sigonella, Catania, Italy*

*corresponding author: mariateresa.caccamo@ipcf.cnr.it

The purpose of this work deals with the study and the development of materials and devices, concerning drones, when exposed to environmental degradation conditions and irradiation of neutrons and charged particles.

In particular, the materials to be used in UAV prototypes will be identified with the aim of reducing the overall weight by ensuring an adequate structural strength. Composite materials will be considered for improved resistance to volcanic dust, which can be a valid alternative to the materials currently in use. Such materials will be characterized by means of spectroscopic techniques, i.e. InfraRed (IR) spectroscopy and Raman scattering.

Finally, the behaviour of electronic devices when exposed to neutron and charged particles irradiation will be investigated. It is well-known that neutron irradiation causes effects that can be destructive or transient, long-term cumulative degradation, or changes in the atomic structure. In this context, irradiation on electronic devices can provide a valid test of reliability and durability. These effects affect reliability, performance, and operation, resulting in temporary events and/or irreversible damage to the affected component, the so-called Single Event Effects (SEE). Ensuring high levels of SEE tolerance due to atmospheric neutrons is of almost importance. In this framework, the electronic devices that will equip the drones will be irradiated with portable, low energy sources, less than 15 MeV and with a flux of 2×10^8 n/sec, with stationary sources and pulsed neutron sources, up to equal energies a 800 MeV. It will be possible to perform long-life and reliability tests at high speeds with respect to the real environment.