

Piezo resistive behavior of GRMs coated glass fiber composite applied to structural health monitoring

Filippo Valorosi^a, Emanuele Treossi^a, Alessandro Kovtun^a, Alessandra Scidà^a, Vincenzo Palermo^a, Antonino Veca^b, Enea De Meo^b, Walter Trerè^b, Francesco Gazza^b, Fulvio Cascio^b, Chiara Mastropasqua^b, Brunetto Martorana^b

^a: Istituto per la Sintesi Organica e la Fotoreattività, CNR, via Gobetti 101, 40129 Bologna, Italy

^b: CRF, Centro Ricerche FIAT, Strada Torino 50, 10043, Orbassano, Torino, Italy

CNR-ISOF, Via Piero Gobetti 101, Bologna, Italia

filippo.valorosi@isof.cnr.it

Thanks to its exceptional properties, glass fiber reinforced polymer composites are widely employed as advanced engineering material, notably in the automotive industry. Damage and failure of composites, unlike metals, are difficult to forecast under real-time stress due to their anisotropic structure. With that focus, we studied the use of Graphene Related Materials (GRMs) as electrical conductive fillers in insulating glass fiber reinforced composites (GFRC). The objective is to add new functionality to the resulting material such as piezo resistivity, a key property that might represent the breakthrough point for FRC components, allowing their structural health monitoring (SHM) which will increase their reliability. In particular, the piezo resistive effect is a change in the electrical resistivity of a material when mechanical strain is applied and in our case is due to the rearrangement of the electrical conductive GRMs network inside the polymer matrix [1]. First, we demonstrated the piezo resistive behavior in the developed composite and second, we proved that it is possible to correlate its resistance variation with the structural health of the SHM prototype.

References

[1] Valorosi et al, Composites Science and Technology 185, 2020, 107848

Figures

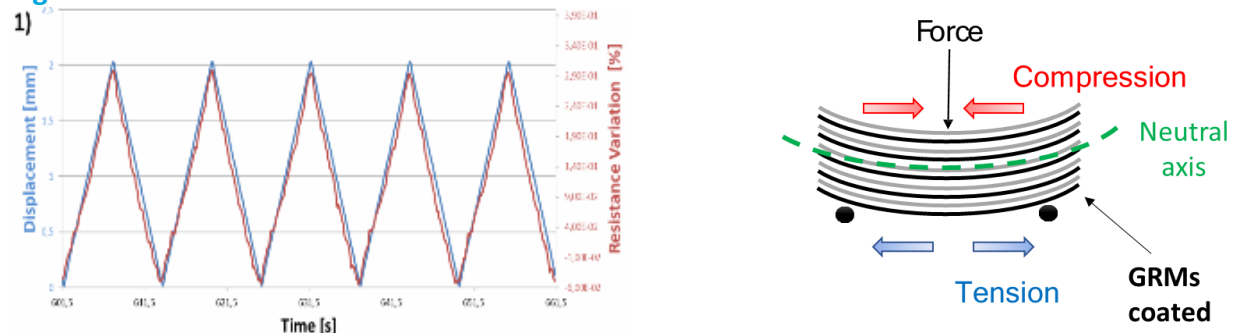


Figure 1: piezo resistive behavior of GRMs coated glass fiber (GF) composite