FEW-LAYER GRAPHENE-BASED SELF-HEATING CONSTRUCTION MATERIALS

Salvatore Polverino[1]
Sebastiano Bellani[2], Luca Gabatel[2], Marilena I. Zappia[2], Francesco Bonaccorso[2,3] and Renata Morbiducci[1]
1 Dipartimento Architettura e Design, Università di Genova, Stradone Sant'Agostino 37, 16123 Genoa, Italy
2 BeDimensional S.p.A., via Lungotorrente secca 30R, 16163 Genoa, Italy
3 Istituto Italiano di Tecnologia, via Morego 30, 16163, Genoa, Italy
Salvatore.polverino@unige.it

Abstract

The European Union (EU) is gradually moving away from fossil fuels, including in the building sector, to reduce carbon emissions and energy dependency on other countries [1,2]. Modernising building heating systems is crucial to reducing environmental impact [3]. In this context, radiant heating systems using innovative materials generate heat through the Joule effect and promote sustainability and high efficiency [4]. The rediscovery of electrothermal systems has led to new non-metallic self-heating systems for easy application in buildings [5]. Graphene and graphene-related materials can play an important role in this process [6].
This contribution aims to illustrate the main features of our approach, which is industrially scalable, to produce self-heating systems based on few-layer graphene (FLG). In particular, FLG/polymer composite coatings have been produced with electrical resistivity down to 0.06 Ω cm. When powered at low voltages (i.e., 25 V), the FLG-based coatings can heat a square (12 cm×12 cm) mortar tile with a thickness of 1.5 cm to more than 160 °C in 3 min (Fig.1a). In addition, as outdoor electrothermal systems, our FLG-based coatings can be used as a renewable source powered de-icing systems (Fig.1b) alternative to the de-icing salts, which are cause of corrosion threat to construction materials.

References

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Figures

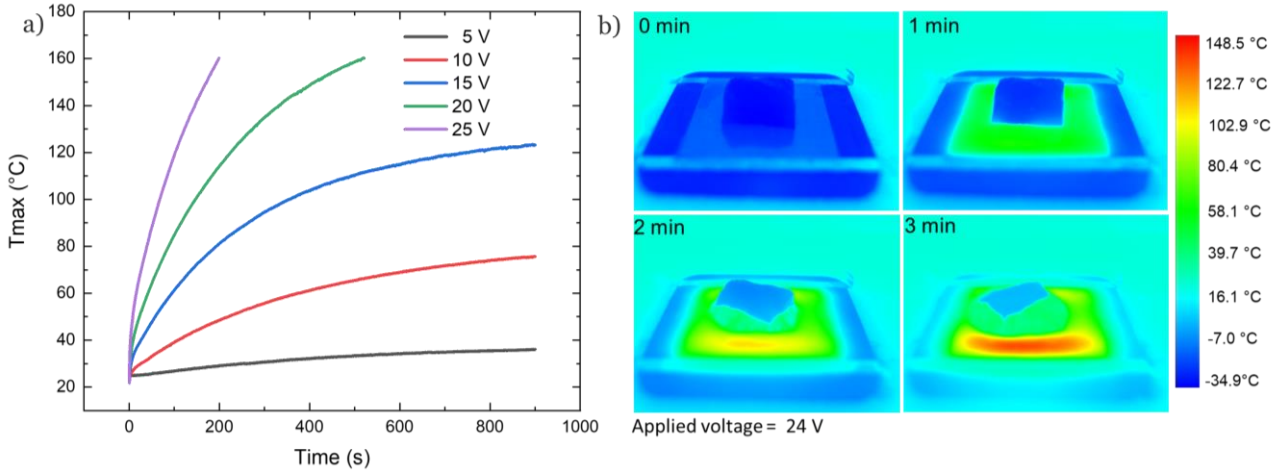

Figure 1: Results of electrothermal test analysis of an FLG-based conductive engineering plastics coating (a); thermal imaging of an FLG-based polyurethane coating during de-icing performance testing (b).