

# Enhanced characteristics of solar absorber coating based on platelets graphene



<sup>1,3</sup>Ervin Šest, <sup>1,3</sup>Goran Dražič, <sup>2</sup>Boštjan Genorio, <sup>1</sup>Ivan Jerman

<sup>1</sup>National institute of Chemistry, Hajdrihova 19, 1000 Ljubljana, Slovenia

<sup>2</sup>Faculty of Chemistry and Chemical Technology, Večna Pot 113, 1000 Ljubljana, Slovenia

<sup>3</sup>Jozef Stefan International Postgraduate School, Jamova cesta 39, 1000 Ljubljana, Slovenia

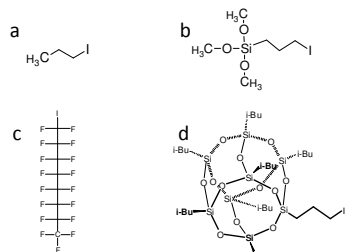


**Abstract:** Platelets graphene as flake like material is one of the nanomaterials suitable for improvement of spectrally selective coatings. Synthesized platelets graphene was used as a corrosion protection agent. With the functionalization of the graphene particles the application of the prepared dispersions is simple and infusion of platelets graphene is less evident. The functionalized material is also a candidate for an improvement of the corrosion inhibition effect. The presented results demonstrate improvements of spectrally selective coatings for low temperature application.

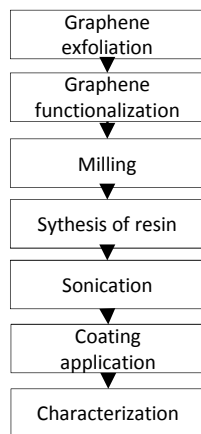
**Aim:**

- ❖ Synthesize<sup>[1,2]</sup> and infuse platelets graphene into the thickness sensitive selective coating (TSSS).
- ❖ To demonstrate the enhanced characteristics of TSSS coating with the infusion of platelets graphene..

**Method:** Raman spectroscopy and atomic force microscopy were used to characterize prepared platelets graphene (especially for the definition of the layers) and coatings. The Fourier Transformation Infrared spectroscopy and UV-Vis spectroscopy were used to determine optical properties of the coatings. Potentiodynamic studies were used to characterize corrosion inhibition effect.

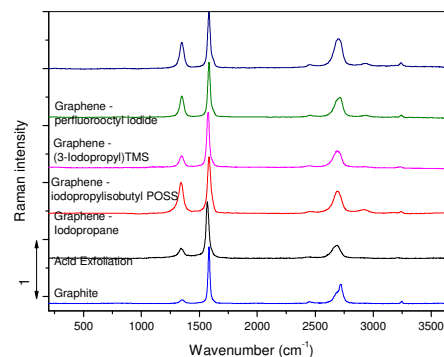


**Fig 1. Functionalization compounds:**  
 • Iodopropane,  
 • (3-Iodopropyl)trimethoxysilane,  
 • Perfluorooctyl iodide,  
 • Iodopropylisobutyl POSS

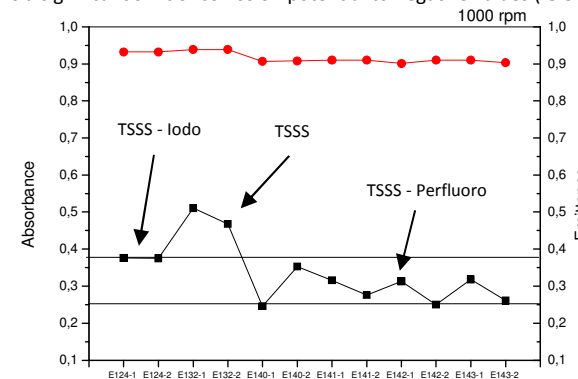


**Fig 2. Workflow of coating preparation**

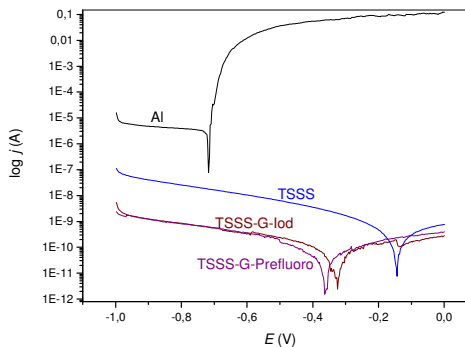
**Results:** With the scanning electron microscope and raman microscopy we determined the exfoliation process of the graphite flakes (seen in Fig. 5 and 6). Coatings did not exhibit the decrease in optical properties (solar absorbance and thermal emittance) in comparison to standard TSSS coatings seen in Fig. 3, in fact thermal emittance values dropped. The polarization curve graphene platelets infused coating shows a significant shift of corrosion potential to negative values (-3.5 V) compared to standard TSSS coating (-1.5 V).



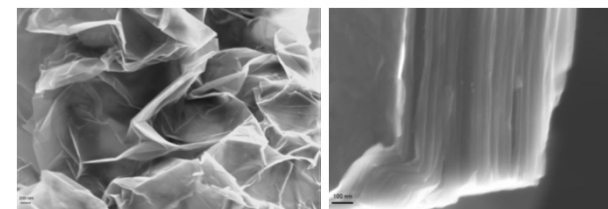
**Fig 5. Samples Raman spectra.**



**Fig 3. Optical measurements**



**Fig 4. Potentiodynamic polarization curves of TSSS coating and graphene enhanced coating.**



**Fig 6. Exfoliated nanoplatelets graphene**

**References:**

[1] B. Genorio, A. Znidarsic, Functionalization of graphene nanoribbons, J. Phys. D: Appl. Phys. 47 (2014)  
 [2] A.M. Dimiev, G. Ceriotti, A. Metzger, N.D. Kim, J.M. Tour, Chemical Mass Production of Graphene Nanoplatelets in ~100% Yield, ACS Nano. (2015)

**Conclusion:** Raman and SEM results show that synthesis of functionalized platelets graphene was successful. With the implementation of platelets graphene we improve optical properties. Already small amount (0.2 wt%) of functionalized platelets material added to the paint dispersion enables relatively cheap enhancement of the solar coating durability. Potentiodynamic polarization curves show great improvement in the corrosion inhibition effect by two decades. The developed coating is suitable for coil-coating application, cheap and easily prepared, appropriate for maritime zone.

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