

# Broadband optical properties of graphene based polymer composites

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Graphene based polymer nanocomposites combine the unique properties of the carbon nanofiller with the elasticity and mechanical durability of the polymer matrix. Although it is common knowledge that only a small amount of graphene can influence e.g. mechanical, electrical, thermal or optical properties of the composite, the exact relation between the graphene loading and change in those properties is still actively pursued by scientific groups worldwide.

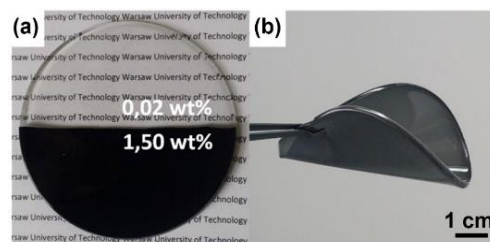
In this work, we present a systematic study of optical properties of graphene-polymer composites with various graphene concentrations in a wide range of wavelengths (0.4-200  $\mu\text{m}$ ). The graphene-polymer composites were prepared by simple blend method, using the polydimethylsiloxane (PDMS) as a polymer matrix and graphene flakes in specified amounts (0,02-2 wt%) as a filler (see Fig. 1 (a), (b)). We show the broadband tunability of transmittance, reflectance and absorption of the composites depending on the graphene flakes loading. Based on the collected data we calculated the absorption coefficient (a) of our material for a broad selection of wavelengths within the VIS-THz range (see Fig. 2). We find that the values are not independent of the wavelength and show significantly different values in the THz region compared to the VIS-IR range. Additionally we compare the collected transmittance of our composite with a multilayer graphene stack model to

determine the correlation between graphene loading and number of graphene layers.

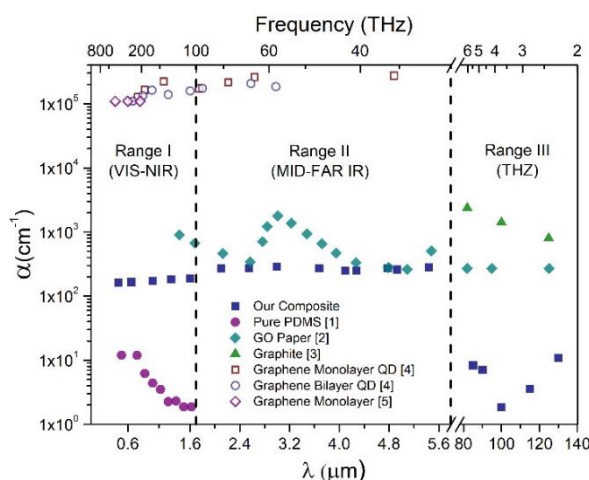
## References

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## Figures



**Figure 1:** Pictures of graphene-PDMS composites (a) with different graphene loading and (b) showing the flexibility of the material.



**Figure 2:** Comparison of calculated absorption coefficient (full squares) and literature data for similar materials.