Estimation of heat propagation speed in the thin graphene-oxide foil by photoacoustic spectroscopy

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The amplitudes and phases of photoacoustic signal measured for the thin foil of graphene oxide (about 20 micrometers) in dependence of modulation frequencies of excitation laser beam are presented. Measurements were performed in a gas-microphone photoacoustic transmission configuration with an open cell of minimum volume [1]. Periodic changes in amplitude and phase at frequencies higher than 4 kHz (Fig.1) were interpreted as a possible consequence of thermal resonances in the sample, which occur due to the thermal memory of graphene oxide [2]. Based on both, the generalized model of photoacoustic response for media with thermal memory [2,3] and the presented measurements, the velocity and diffusion lengths of heat propagation in graphene oxide were determined. The estimated value of the heat propagation speed indicates the presence of relaxation phenomena in graphene oxide whose rate is of the same order of magnitude as in polymeric materials [4] and which are much slower than those in crystalline solids. It is in agreement with existing knowledge about structure properties of graphene oxide [5,6].

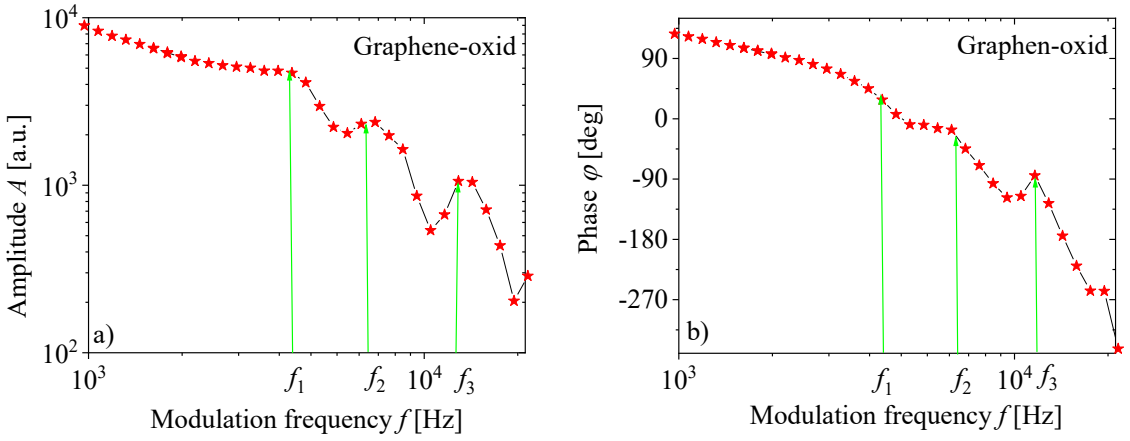

Fig. 1. Experimental measurements of **(a)** amplitudes and **(b)** phases of photoacoustic response of graphene-oxide foils which thickness is 20 micrometers. Measurements were performed in a gas-microphone photoacoustic transmission configuration with an open cell of minimum volume

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