Spatially Resolved Optical Micro-Spectroscopy

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Introduction

Over last few years we have developed several probes for CW magneto-optical spectroscopy (Raman, PL, reflectance) which allow probing ~>100um size samples in magnetic fields up to 45T. The next goal is to perform experiments on microscopic-size samples, including simultaneous magneto-optics and magneto-transport measurements on contacted/gated samples.

Results and Discussion

First, we focused on developing micro-spectroscopy large diameter magnets (14.5T EMR, SCM2, SCM3). Fig.1 shows a schematic view of a sample stage equipped with a set of XYZ piezo-positioners. This setup has been tested with the aforementioned magnets. The results are very encouraging. For example, we were able to spatially resolve the Raman signal from gated single- and trilayer graphenes, approximately (20 um x20um) each. However, we found that sweeping magnetic field up to ~18T induces excursion of the focal point of up to ~5um. Also, we found that one could not reach temperatures below ~600mK, which is most probably caused by low thermal conductivity of the titanium parts and piezo-electric actuators.

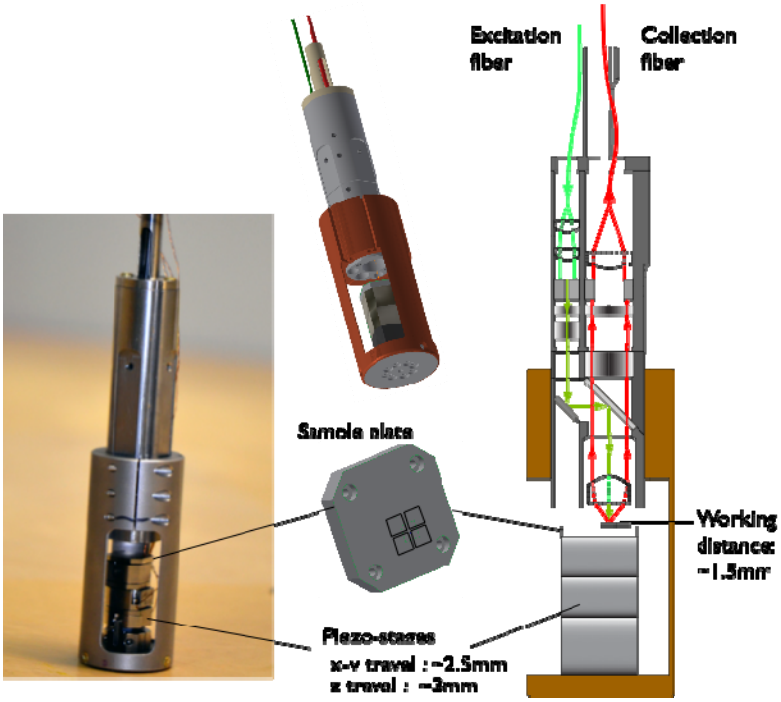

Fig. 1. Magneto-PL/Raman optical head for studying um-size samples. The optical assembly OD is 24mm.

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