Measurement of heat capacity in transition metal dichalcogenides by pulse heating technique

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The two-dimensional character of van der Waals layered materials makes them have extraordinary properties compared to bulk materials. Among these properties, the interest in thermal properties in 2D materials has grown in recent years. Having a deep understanding of these properties is crucial for know their behaviour and future applications. Heat capacity is a property that determines the amount of energy required to raise the temperature of a substance. Heat transport and thermal conductivity has already been highly studied but heat capacity has never been measured directly. In this work we will focus on the measurement of $MoSe_2$ exfoliated nanoflakes by using the pulse heating technique to measure the heat capacity. This technique is a calorimetric method used to measure the heat capacity of a sample by rapidly heating it for a brief period, followed by a period of cooling. With this technique we are able to measure the dependence of heat capacity on the number of $MoSe_2$ layers. The measurements will be made with membrane-based calorimeters, on which Pt is deposited, which acts as a heater/sensor. The ultimate goal of this project is to be able to determine the heat capacity of a single $MoSe_2$ monolayer.

Figures

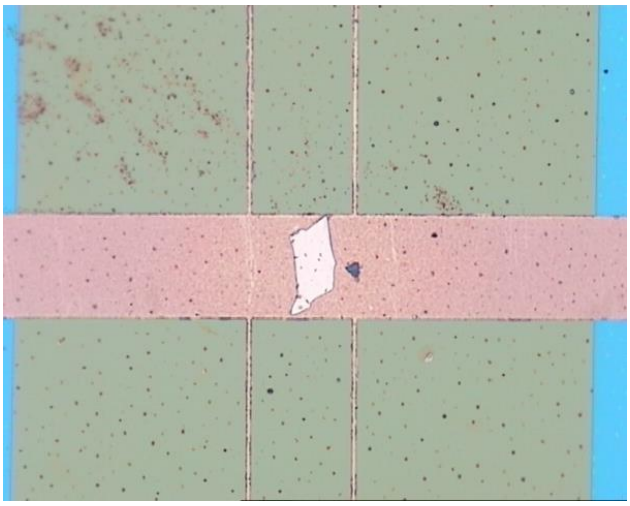

Figure 1: $MoSe_2$ flake transferred over the calorimetric cell

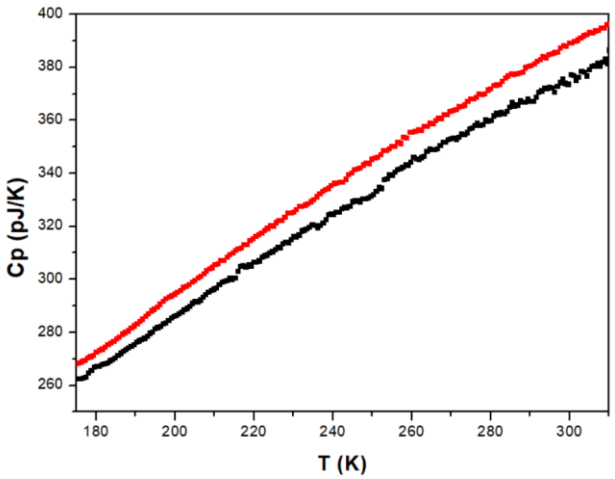

Figure 2: Heat capacity of empty chip (black dots) against the combined heat capacity of the chip and $MoSe_2$ flake (red dots).