Raman spectroscopy of TiS$_2$ thin films

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Since the graphene unique properties has been discovered, other two dimensional materials like transition metal dichalcogenides are wildly investigated [1, 2]. One of these 2D materials is a titanium disulphide, which may by a promising candidate for applications in lithium-ion batteries, high conductivity electrodes or thermoelectric cells [3, 4]. To assure that TiS$_2$ can be used in any of these applications a better understanding of the material properties is needed. Raman spectroscopy is a powerful method for this purpose.

Here, we report the Raman spectroscopy measurements of the 1T - TiS$_2$ thin films on SiO$_2$/Si substrate. Samples were prepared by a standard mechanical exfoliation method from 1T - TiS$_2$ bulk crystal (figure 1).

In details, we show the temperature-dependent (80 - 450 K) Raman measurements of titanium disulphate (figure 2) with determination of the first-order temperature coefficients for each modes (A$_{1g}$, A$_{1g}'$ and E$_g$). Moreover the evolution of the Raman modes as a function of the TiS$_2$ film thickness was designated.

These results contribute to the understanding of the thermal and optical properties in titanium disulphate films, which are crucial for use in a variety of future applications.

References


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**Figure 1:** Crystal structure of 1T-TiS$_2$; side view - on the left and top view – on the right.

**Figure 2:** Normalized Raman spectra for ~ 80 nm thick TiS$_2$ film shown at selected temperatures, measured for 514 nm laser line.