



Photo-conductance of MoSi₂ nanoparticle layers in the near ultraviolet and visible spectral ranges

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Photo-conductance of quasi-2D layers of molybdenum disilicide nanoparticles was studied under pulse-periodic laser pumping in the spectral range from 355 nm to 480 nm. The layers were prepared using deposition of nanoparticles from water suspensions onto the interdigital electrode systems. The influence of temperature on the photo-conductance is examined.

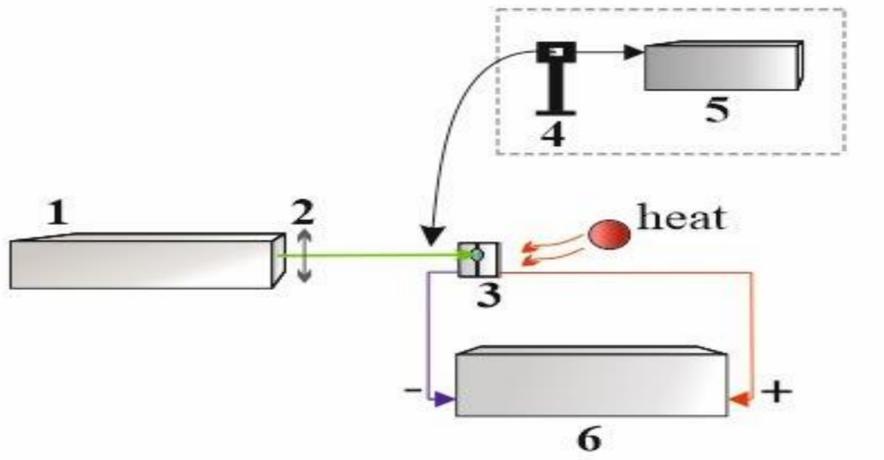


Figure 1 - Scheme of the experimental setup.

1 – LOTIS TII-2145-OPO; 2 - Short-focus lens; 3 - Sample; 4 - Energy meter head Gentec Q12MF1; 5 – Gentec measuring unit; 6 – Teraohmmeter (Tetron M13A).

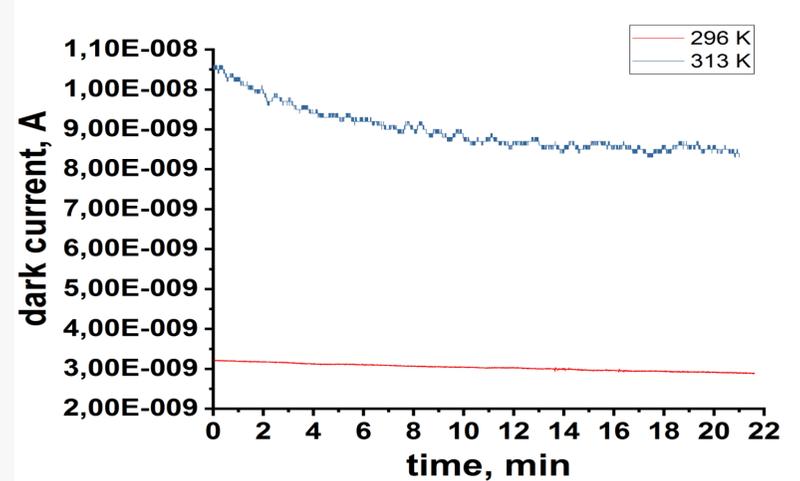


Figure 2. Dark current; blue curve corresponds to T=296K; red curve-T=313K.

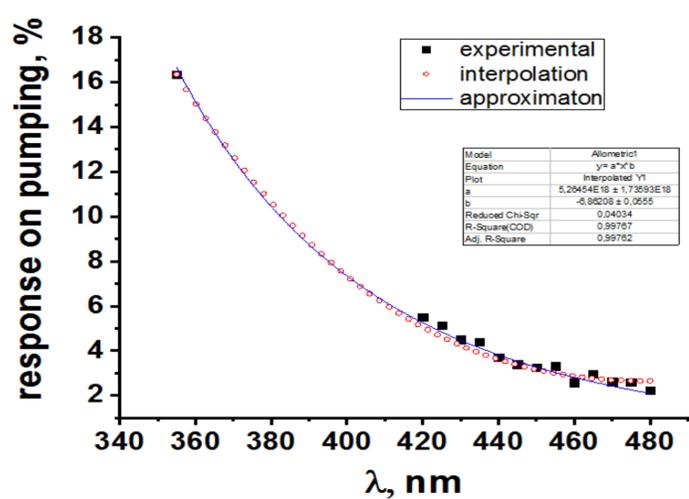


Figure 3. Photo-response of the sample to laser pumping at T=296K: the black markers correspond to the experimental data, the red markers are the interpolation data for the photo-response in the studied wavelength range. The blue curve shows the result of approximation by the function $y=ax^b$.

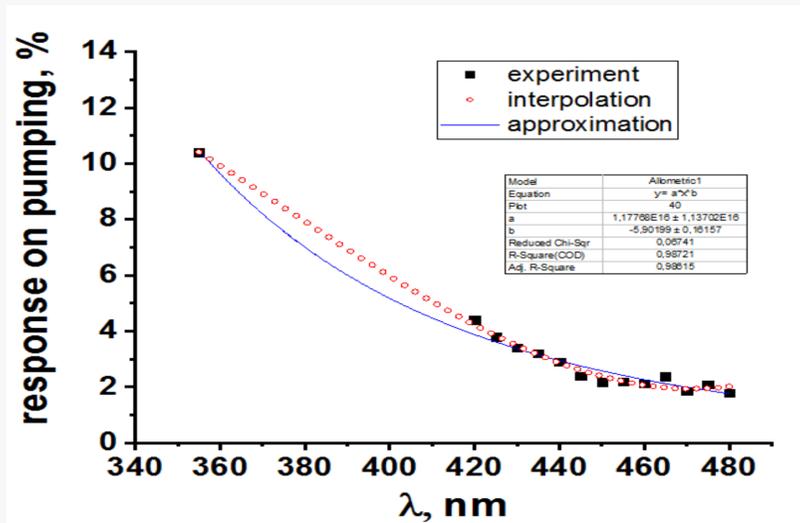


Figure 4. Photo-response of the sample to laser pumping at T=313K: the black markers correspond to the experimental data, the red markers are the result of interpolation of the distribution of the photo-response in the studied wavelength range. The blue curve shows the result of approximation by the function $y=ax^b$.

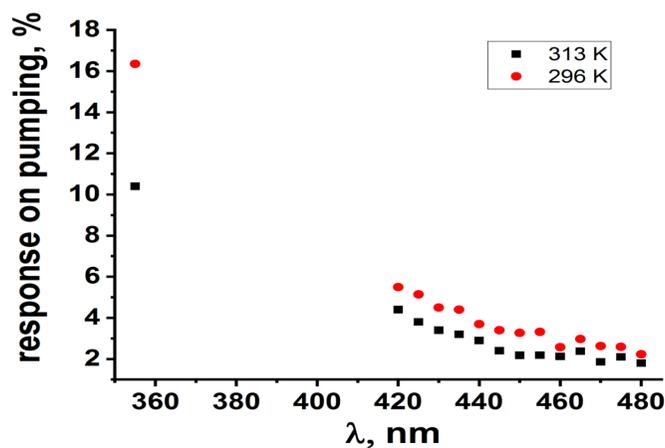


Figure 5. Comparison of experimental data presented in figure 3 and figure 4; red markers correspond to T=296K, black markers - to T=313K.

Acknowledgment

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Conclusions

The results on the photoconductivity of molybdenum disilicide nanoparticles are presented. The system under study is characterized by extremely low values of the optical response in the ultraviolet and visible range, which is explained by the electronic properties of the material, and the main excitation mechanism can be described by the formation of mobile charge carriers in the localization zone of the laser pulse and the possibility of electron tunneling through the inter-particle energetic barriers.