MEDNARODNA PODIPLOMSKA ŠOLA JOŽEFA STEFANA

JOŽEF STEFAN INTERNATIONAL POSTGRADUATE SCHOOL

Growth of Thin Films of Charge Density Wave System $K_{0.3}MoO_3$

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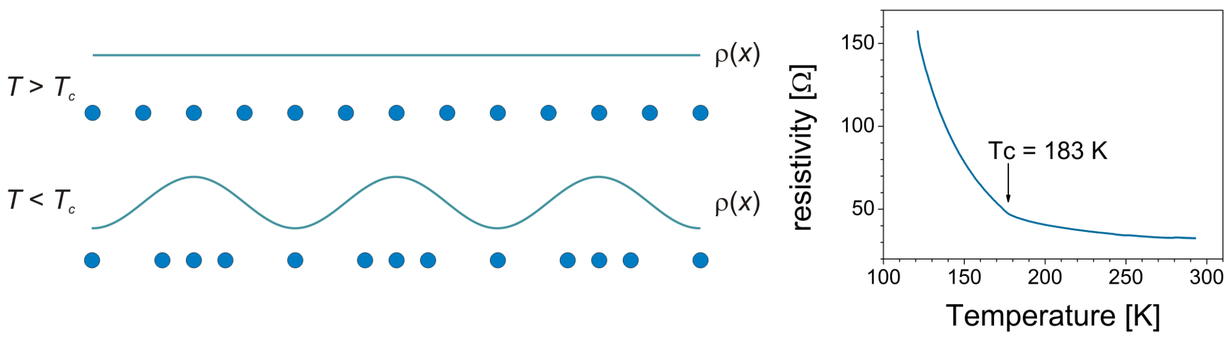
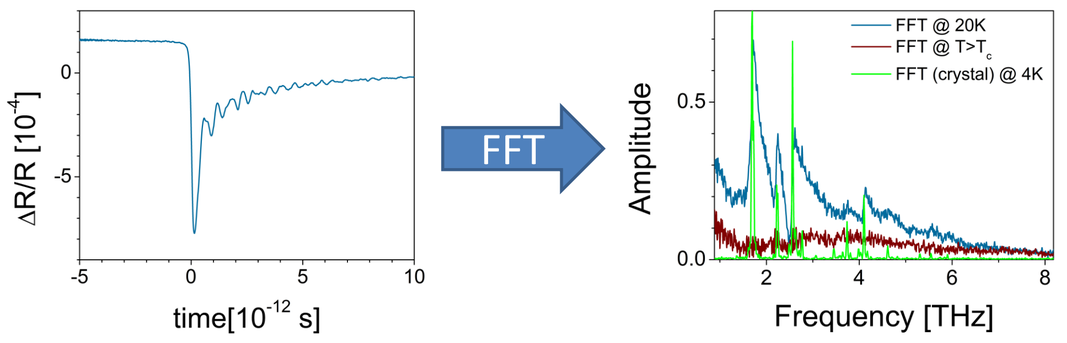
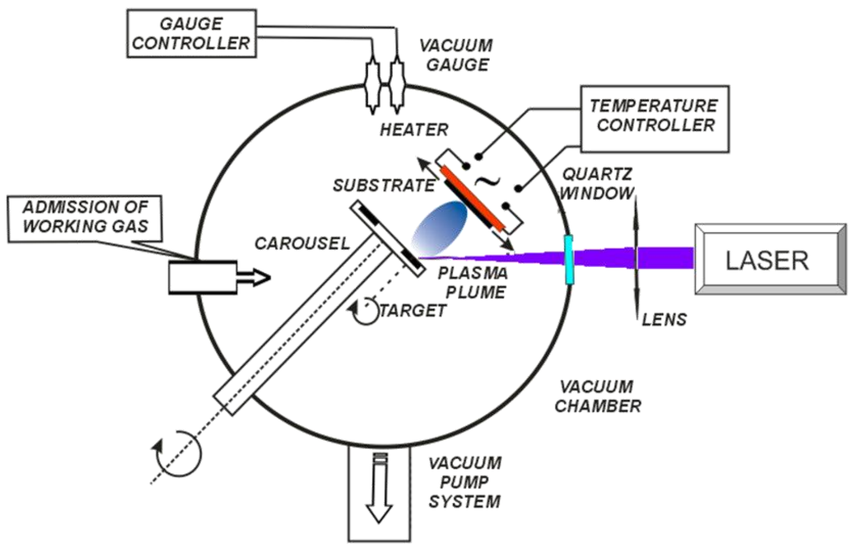
Charge density wave is a spatially modulated superstructure of conducting electrons accompanied by a 1D metal to semiconductor transition which can form in quasi one dimensional systems below the transition temperature T_c.

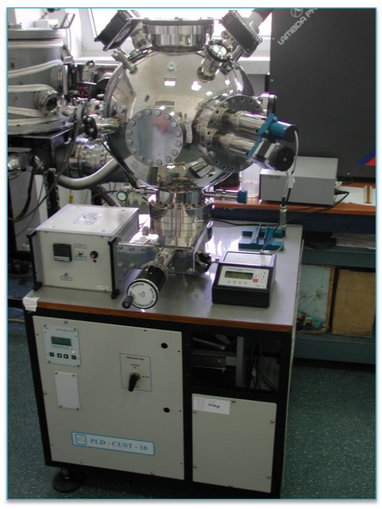


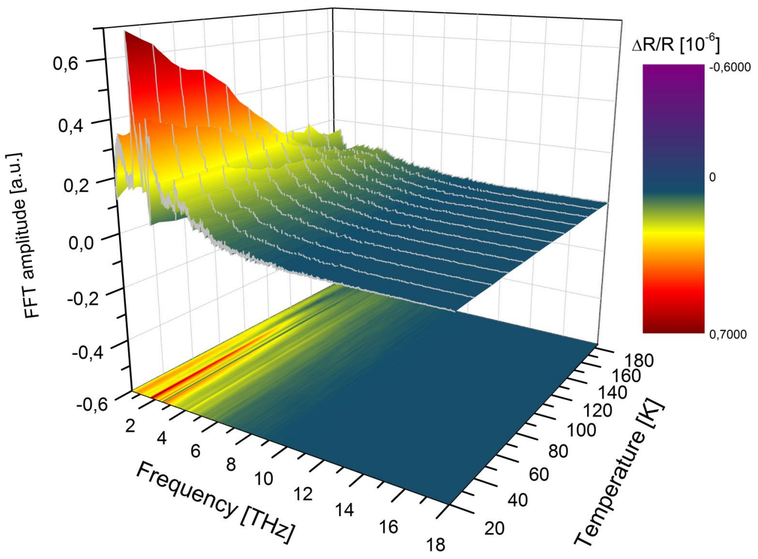
The final proof of film composition and of the CDW transition was obtained by means of *femtosecond spectroscopy* [1-3]. The films were photoexcited by a femtosecond optical pulse and the resulting relaxation dynamics was measured by following the dynamics of changes in the dielectric function as a function of the time delay after perturbation.



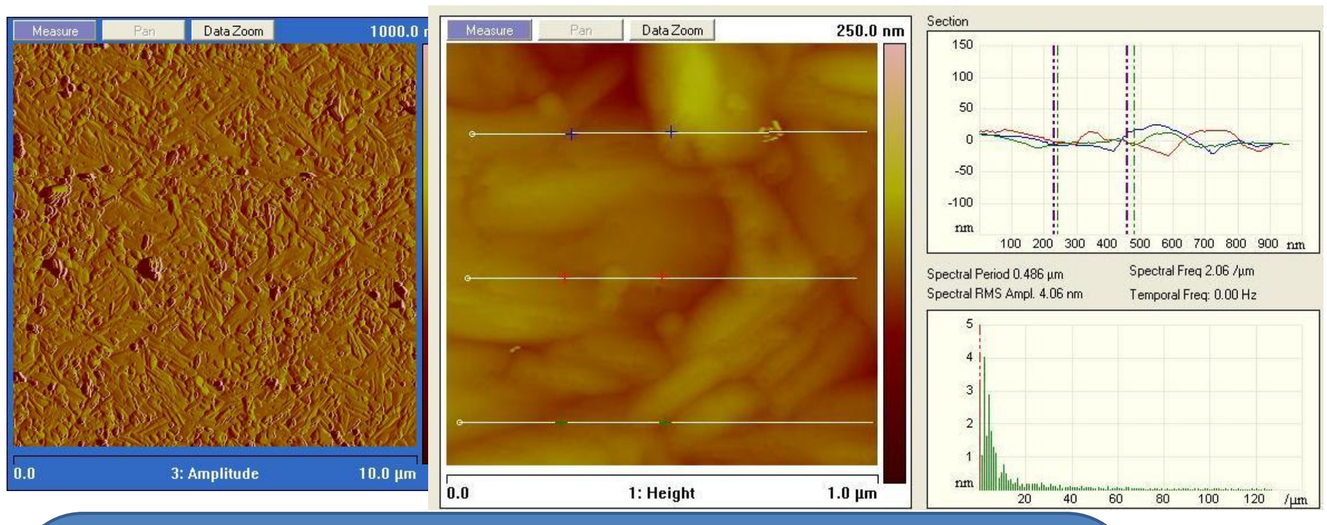
Films were grown by *Pulsed laser deposition*



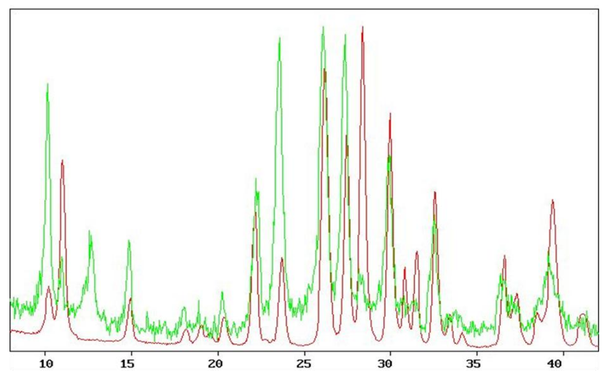




AFM measurement shows ordering and low roughness of the film surface.



X-ray diffraction measurements lent further proof of similar film (green line) and bulk (red line) crystal structure.



References:

[1] J. Demšar et al. Single Particle and Collective Excitations in the One-Dimensional Charge Density Wave Solid $K_{0.3}MoO_3$ Probed in Real Time by Femtosecond Spectroscopy. *Physical Review Letters*, 83(4):800-803, 1999

[2] A. Tomeljak et al. Femtosecond nonequilibrium dynamics in quasi-1D CDW systems $K_{0.3}MoO_3$ and $K_{0.3}MoO_3$. *Physica B, Condensed Matter*, 404(3/4):548-551, 2009

[3] A. Tomeljak et al. Dynamics of photoinduced charge-density-wave to metal phase transition in $K_{0.3}MoO_3$. *Physical Review Letters*, 102(6): 066404-1-066404-4, 2009

Conclusions:

- In collaboration with our foreign partners, we were able to grow several high quality films of a CDW material $K_{0.3}MoO_3$ on different substrates.
- By probing the films using very different characterization techniques, we were able to fine tune the parameters that yielded the best quality films and we determined their composition and quality.