



Experiment title:
Pokrovsky-Talapov Commensurate-
Incommensurate Transition in the
CO/Pd(100) System

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Report:

CO adsorption on Pd(100) forms a series of ordered structures with **varying** coverage. In particular at $\theta = 0.5$ ML a commensurate centered ($2\sqrt{2} \times \sqrt{2}$) structure is formed, which undergoes a transition into incommensurate structures with increasing CO coverage [1, 2].

We performed surface X-ray diffraction measurements, where we kept the crystal in equilibrium with a constant pressure of CO, adjusting the coverage by varying the sample temperature. This allowed us to measure the critical exponents of the incommensurability versus the reduced temperature during the transition under conditions of constant chemical potential.

The figure shows the results for four different background pressures, each with its own critical temperature. Upward and downward triangles correspond to ramping up or down of the temperature during the experiment. All curves

exhibit a slope of $\beta = 0.5 \pm 0.05$ in agreement with a Pokrovsky-Talapov transition from the commensurate phase into the incommensurate one, which is expected from the four-fold degeneracy of the commensurate phase [3]. Such a transition should be driven by the entropy of creation of domain walls, separating the translational domains of the commensurate phase, which is supported by the structure [4].

[1] J. C. Tracy and I. W. Palmberg, *J. Chem. Phys.* 51,4852 (1969).

[2] W. Berndt and A.M. Bradshaw, *Surf. Sci. Lett.*, 279, L165 (1992).

[3] P. Bak and M. Paczuski, in *Phase Transitions and Adsorbate Restructuring at Metal Surfaces* Vol. 7, Eds. D. A. King and P. Woodruff, (Elsevier, Amsterdam, 1994), pp. 1.

[4] R. Schuster, I. K. Robinson, K. Kuhnke, S. Ferrer, J. Alvarez and K. Kern, accepted for publication in *Phys. Rev. B* (1996).

