

FEMTOSECOND-LASER INDUCED DYNAMICS OF CO ON Ru(0001): NEW INSIGHTS FROM A HOT-ELECTRON, ELECTRONIC FRICTION MODEL INCLUDING SURFACE MOTION

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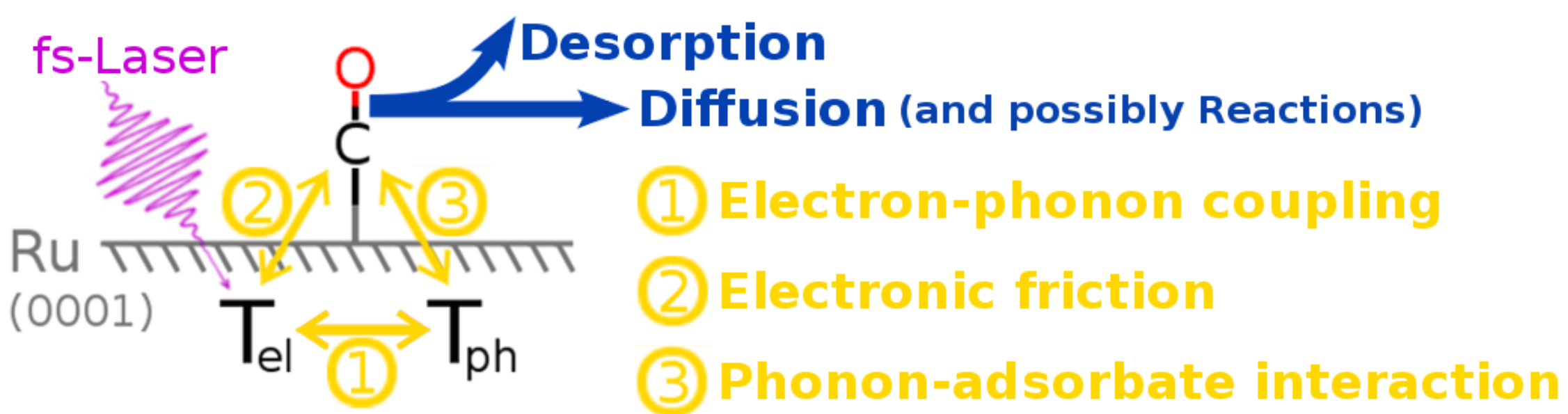
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Introduction

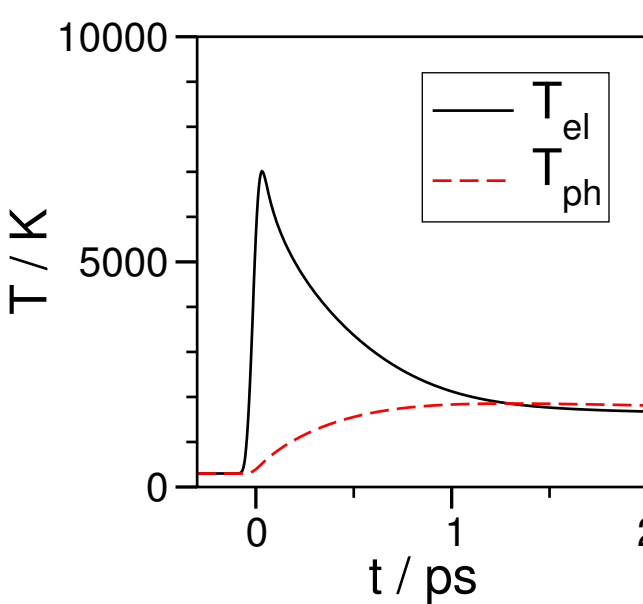
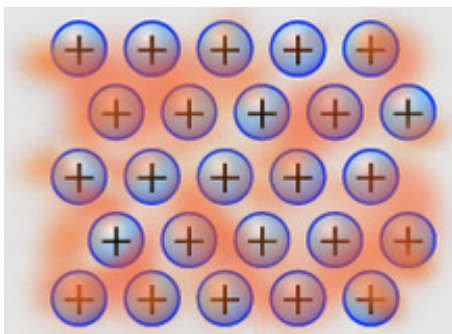
Motivation

- research on small molecules adsorbed to metals is important for:
 - catalytic applications
 - fundamental understanding of bonding
- femtosecond(fs)-lasers are a valuable tool for such research as they
 - allow for investigations on small timescales
 - open up new processes compared to heating (femtophotochemistry)
 - may enable specific control over catalytic reactions (photocatalysis)

How FL-irradiation affects metal surfaces



- metals: ion lattice plus quasi-free electron gas
- visible light is absorbed by the electrons only
- energy is transferred to ion lattice, via ① **electron-phonon coupling**, to ion lattice (phonons = lattice vibrations)
- equilibration process completes after ~ 1 ps
- Thus, with fs-lasers, two temperatures emerge:
 - T_{el} - electron temperature
 - T_{ph} - phonon temperature
- can be simulated with Two-Temperature Model (TTM) [1]



Models and Methods

References

- [1] S. I. Anisimov, B. L. Kapeliovich, and T. L. Perel'man, *Sov. Phys.-JETP* **39**, 375 (1974).
- [2] M. Dell'Angela, T. Anniyev, M. Beye et al., *Science* **339**, 1302 (2013).