# Electron emission from tungsten surface induced by neon ions

**Zhongfeng Xu[*†#1], Lixia Zeng[*†&2], Yongtao Zhao[*#], Rui Cheng[#], Xiaoan Zhang[#&], Jieru Ren[#], Xianming Zhou[#], Xing Wang[#], Yu Lei[#], Yongfeng Li[#], Yang Yu[#], Xueliang Liu[*†], Guoqing Xiao[*#], Fuli Li[*†]**

[*] HCI Joint Center of XJTU-IMP, Xi'an, China
[†] Department of Applied Physics, Xi'an Jiaotong University, Xi'an, China
[#] Institute of Modern Physics, Chinese Academy of Science, Lanzhou, China
[&] School of Physics and Electronic Engineering, Xianyang Normal University, Xianyang, China

**Synopsis** The electron emission from W surface induced by $Ne^{q+}$ has been measured. For the same charge state, the electron yield gradually increases with the projectile velocity. Meanwhile, the effect of the potential energy of projectile has been found obviously. Our results give the critical condition for "trampoline effect".

The effect of secondary electron emission (SEE) from surfaces under ion bombardment has been extensively studied during several decades because of its fundamental and technological importance. Here in this work, we present experimental results for electron emission yield γ of $Ne^{q+}$ ($q$=2,8) impacting on tungsten surface at normal incidence and discuss the mechanism of electron emission.

The experiment was done at the Atomic Physics Research Platform on the Electron Cyclotron Resonance Ion Source of HIRFL. The projectile energy is ranging from 5 keV/u to 25 keV/u, as we know, this energy range has not been researched by others.

Figure 1 represents γ gradually increases with the projectile energy per mass unit. That is to say, for the same charge state, γ gradually increases with the projectile velocity. It also can be easily found that the effect of charge state to γ is obvious. Basing on "single hole without hopping" [1] hypothesis, Our result will give the critical condition for the "trampoline effect" [2,3].

Finally, we calculate the total stopping power $S$, the electron stopping power $S_e$ and the nuclear stopping power $S_t$ for $Ne^{q+}$ impact on W surface by SRIM2008. We can find that recoiling atoms are of crucial importance in electron emission when $E/M$ is low.

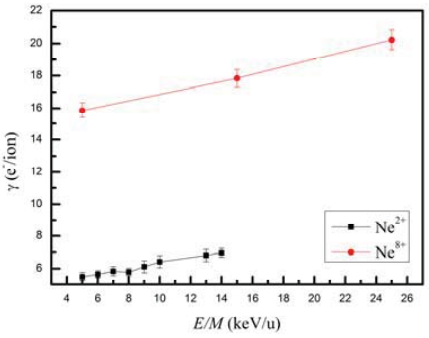


**Figure 1.** Total electron yield γ as a function of projectile kinetic energy per mass unit for $Ne^{q+}$ impact on W surface.

The work is supported by the National Natural Science Foundation of China (Grant Nos.11075125, 11075135 and 11075192), the Major State Basic Research Development Program of China (Grant No.2010CB832902),the Natural Science foundation of Shaanxi Province (Grant No.09JK806), and the Foundation of Xianyang Normal University (Grant No.12XSYK018).

## References

[1] L Wirtz *et al* 2003 *Phys. Rev. A* **67** 012903
[2] JP Briand *et al* 1996 *Phys. Rev. Lett.* **77** 1452
[3] Z Xu *et al* 2012 *Laser and Particle Beams* **30** 319

[1]E-mail: zhfxu@mail.xjtu.edu.cn
[2]E-mail: zenglixia1982@126.com