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Transient optical signature of Mott behavior in $K_xFe_{2-y}Se_2$ superconductors WEI LI, CHUNFENG ZHANG, SHENGHUA LIU, XIAXIN DING, XUEWEI WU, XIAOYONG WANG, HAI-HU WEN, Nanjing University, MIN XIAO, University of Arkansas — It is a central focus whether iron-based superconductors are in close proximity to Mott behavior driven by electron correlation. The recently discovered new family of alkaline iron selenide superconductors show a resistivity hump at temperature in a range of 100-250 K. However, such a metal-insulator crossover can also be viewed as parallel resistors consisted of metallic and insulating phases that are spatially separated. Here, we utilize dual-color pump-probe spectroscopy to study the quasiparticle dynamics with respect to Mott behavior in normal state of $K_xFe_{2-y}Se_2$ superconductors. Besides multi-exponential decay recovery dynamics of photo-induced quasiparticles, a damped oscillatory component due to coherent acoustic phonons emerges when the superconducting phase is suppressed by increasing temperature or excitation power. Upon raising temperature to 150-170 K, the oscillatory component diminishes together with significant enhancement of the slow decay component in the recovery traces. These results can be understood with the picture of gap opening in certain k directions, implying a vital role played by electron correlation in the iron-based superconductors.

Chunfeng Zhang
Nanjing University

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