Abstract Submitted
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Hot Carrier Transport at the Graphene-Metal Interface Induced by Strong Lateral Photo-Dember Effect[1] CHANG-HUA LIU, YOU-CHIA CHANG, NANDITHA DISSANAYAKE, YAOZHONG ZHANG, ZHAOHUI ZHONG, University of Michigan — Ultrafast photo-excitation in a semiconductor can lead to transient spatial charge gradient if electrons and holes have different drift velocities. The charge gradient builds up the transient electric field and causes the subsequent terahertz pulse emission. This phenomenon, known as the photo-Dember effect, was typically considered insignificant in graphene due to its similar electron and hole mobilities. Here, we observe hot carrier transport at the graphene-metal interface driven by the photo-Dember electric field under femtosecond pulse laser excitation. The polarity of hot carrier transport is determined by the asymmetry of electron and hole mobilities of the graphene device and cannot be flipped sign by tuning graphene doping level. This indicates the formation of strong photo-Dember field, dominating over the graphene/metal built-in electric field or thermal electric field. We further analyze the spatial distribution and temporal evolution of the transient electric field near the contact edge by using the drift-diffusion model. The modeling results suggest that strong photo-Dember effect is caused by the low electronic specific heat of graphene and a huge charge gradient near the graphene-metal interface under pulse laser excitation.

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