

补充材料

混合失配模型预测金属/半导体界面热导

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I 金属和半导体材料的声子群速度

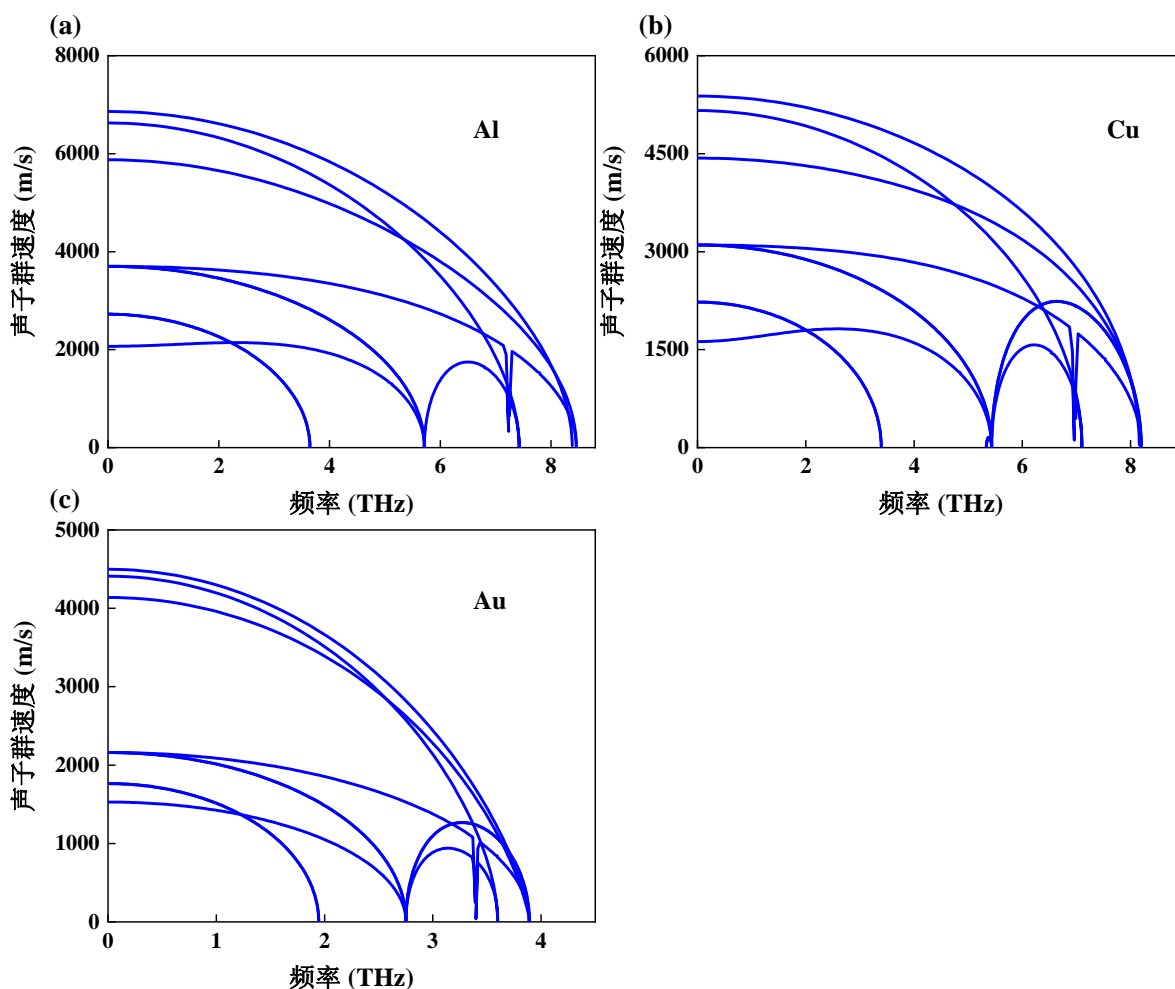


图 S1 金属材料的声子群速度 (a) Al; (b) Cu; (c) Au

Fig. S1. Frequency dependent phonon group velocities of metallic materials: (a) Al; (b) Cu; (c) Au.

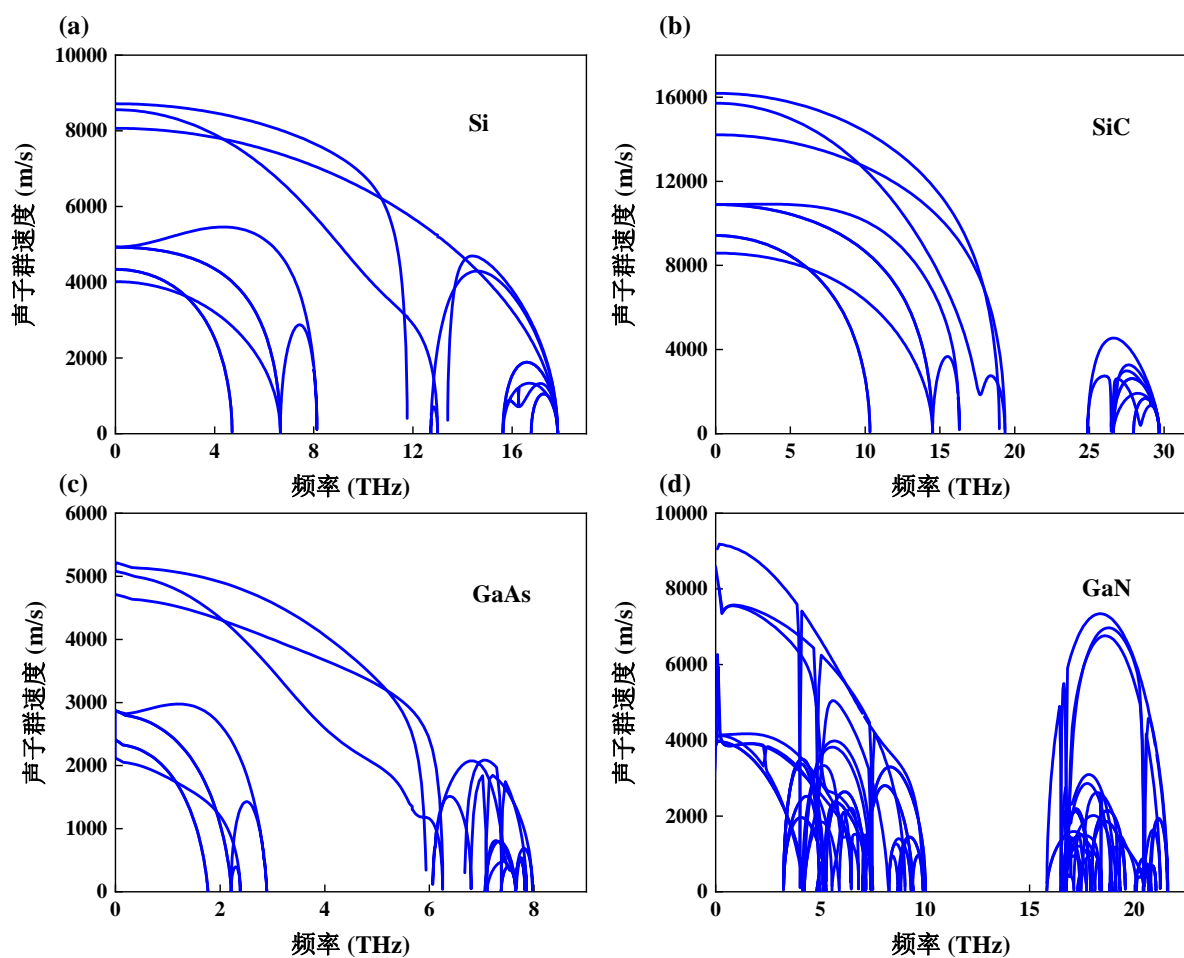


图 S2 半导体材料的声子群速度 (a) Si; (b) SiC; (c) GaAs; (d) GaN

Fig. S2. Frequency dependent phonon group velocities of semiconductor materials: (a) Si; (b) SiC; (c) GaAs; (d) GaN.

II Cu/半导体界面和 Au/半导体界面声子透射率频谱

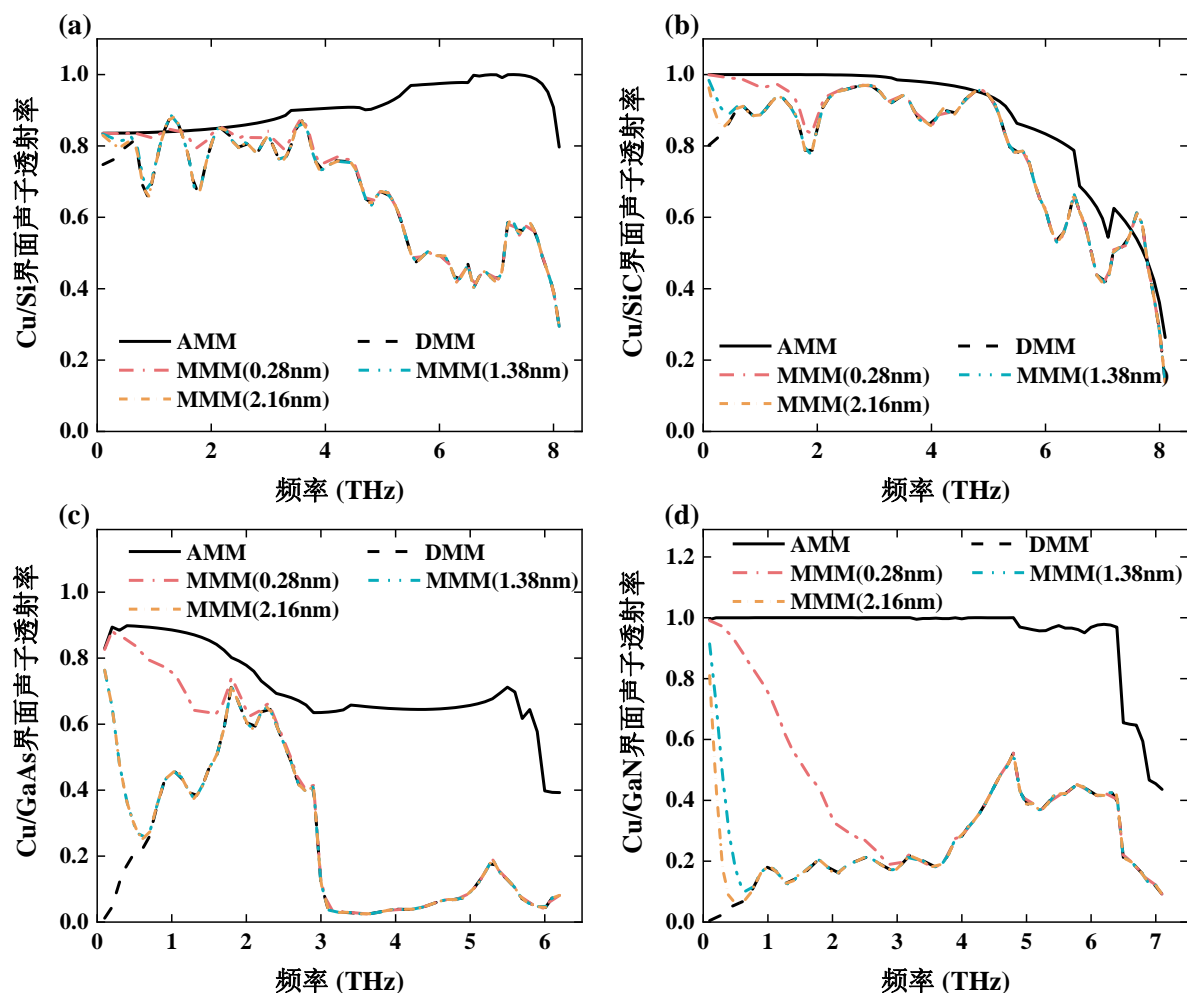


图 S3 AMM, DMM 和 MMM (粗糙度: 0.28, 1.38, 2.16 nm) 三种模型计算界面声子透射率频谱对比 (a) Cu/Si 界面; (b) Cu/SiC 界面; (c) Cu/GaAs 界面; (d) Cu/GaN 界面

Fig. S3. Comparisons among frequency dependent phonon transmittance spectra calculated by AMM, DMM and MMM (roughness: 0.28, 1.38, 2.16 nm) for (a) Cu/Si interface, (b) Cu/SiC interface, (c) Cu/GaAs interface, and (d) Cu/GaN interface.

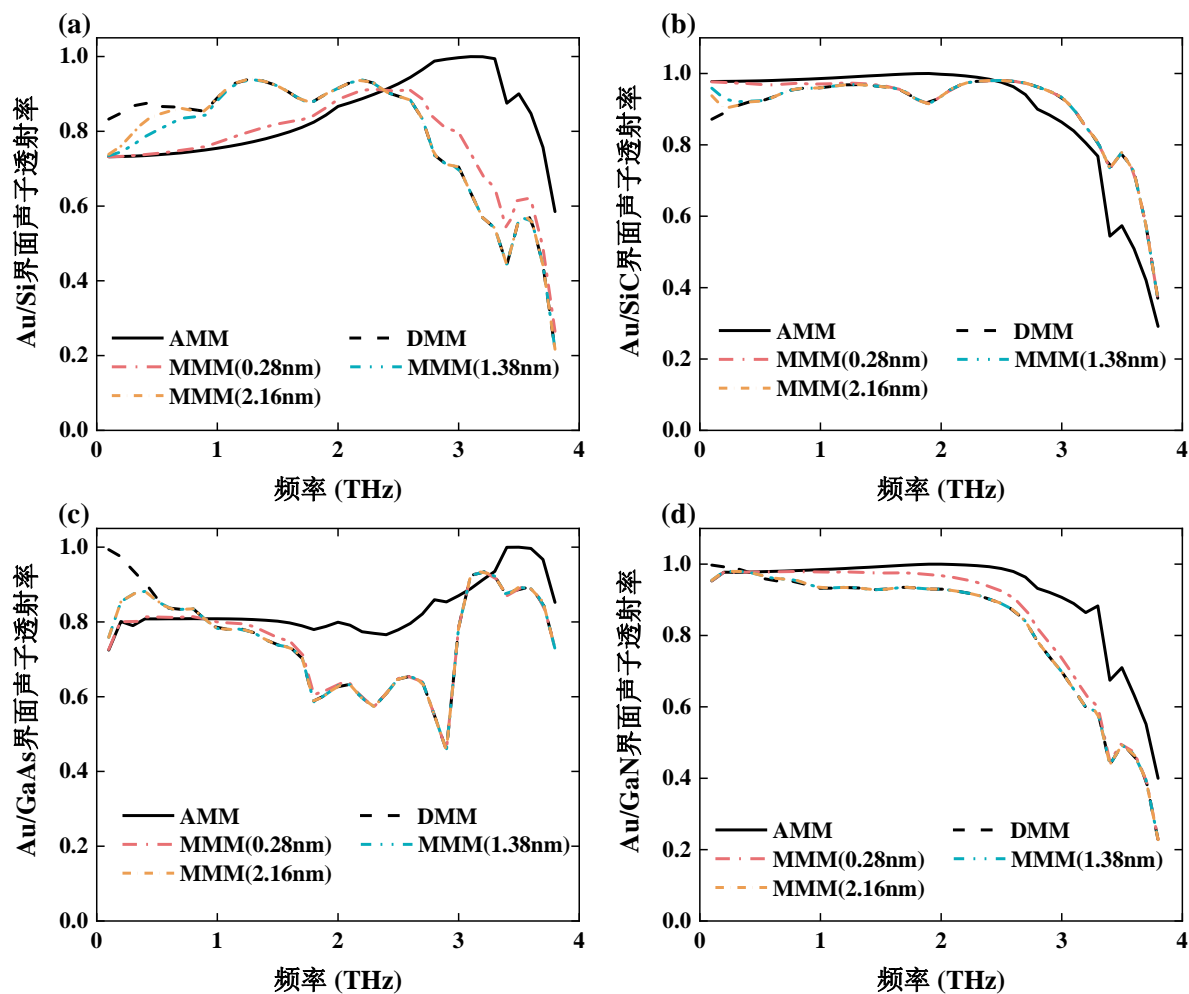


图 S4 AMM, DMM 和 MMM (粗糙度: 0.28, 1.38, 2.16 nm) 三种模型计算界面声子透射率频谱对比 (a) Au/Si 界面; (b) Au/SiC 界面; (c) Au/GaAs 界面; (d) Au/GaN 界面

Fig. S4. Comparisons among frequency dependent phonon transmittance spectra calculated by AMM, DMM and MMM (roughness: 0.28, 1.38, 2.16 nm) for (a) Au/Si interface, (b) Au/SiC interface, (c) Au/GaAs interface, and (d) Au/GaN interface.

III 不同界面的 η_{\max} 值表 S1 不同界面对应的 η_{\max} 值 (单位: nm)Table S1. η_{\max} values corresponding to different interfaces (unit: nm).

界面	η_{\max}/nm
Al/SiC	4.3
Al/GaAs	5.2
Al/GaN	4.6
Cu/Si	4.4
Cu/SiC	4.1
Cu/GaAs	5.0
Cu/GaN	4.4
Au/Si	4.8
Au/SiC	4.4
Au/GaAs	5.3
Au/GaN	4.7

IV Cu/半导体界面和 Au/半导体界面随温度变化曲线图

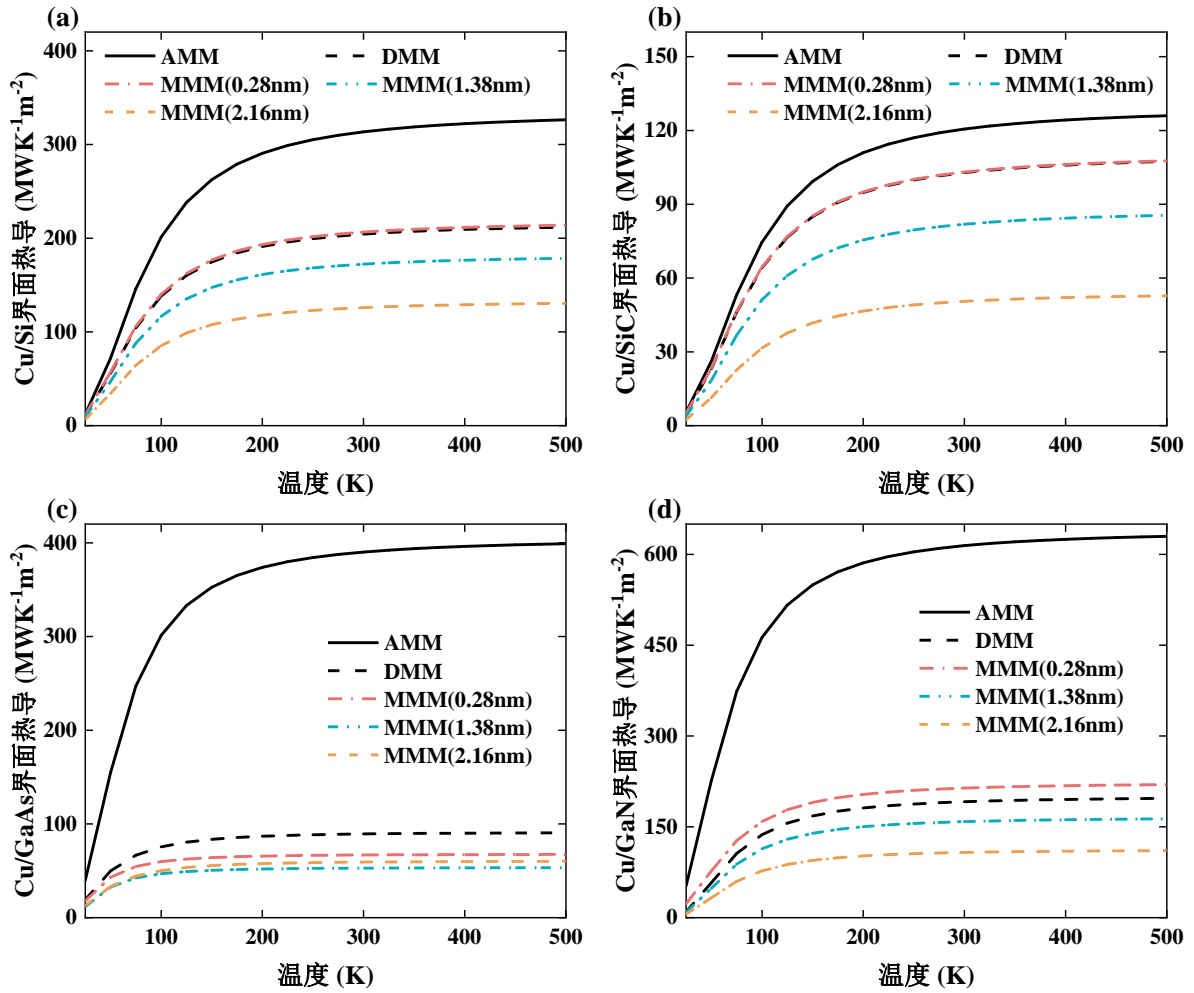


图 S5 AMM, DMM 和 MMM (粗糙度: 0.28, 1.38, 2.16 nm) 模型预测界面热导随温度的变化 (a) Cu/Si 界面; (b) Cu/SiC 界面; (c) Cu/GaAs 界面; (d) Cu/GaN 界面

Fig. S5. Curves of thermal conductance as a function of temperature, predicted by AMM, DMM and MMM (roughness: 0.28, 1.38, 2.16 nm) models for (a) Cu/Si interface, (b) Cu/SiC interface, (c) Cu/GaAs interface, and (d) Cu/GaN interface.

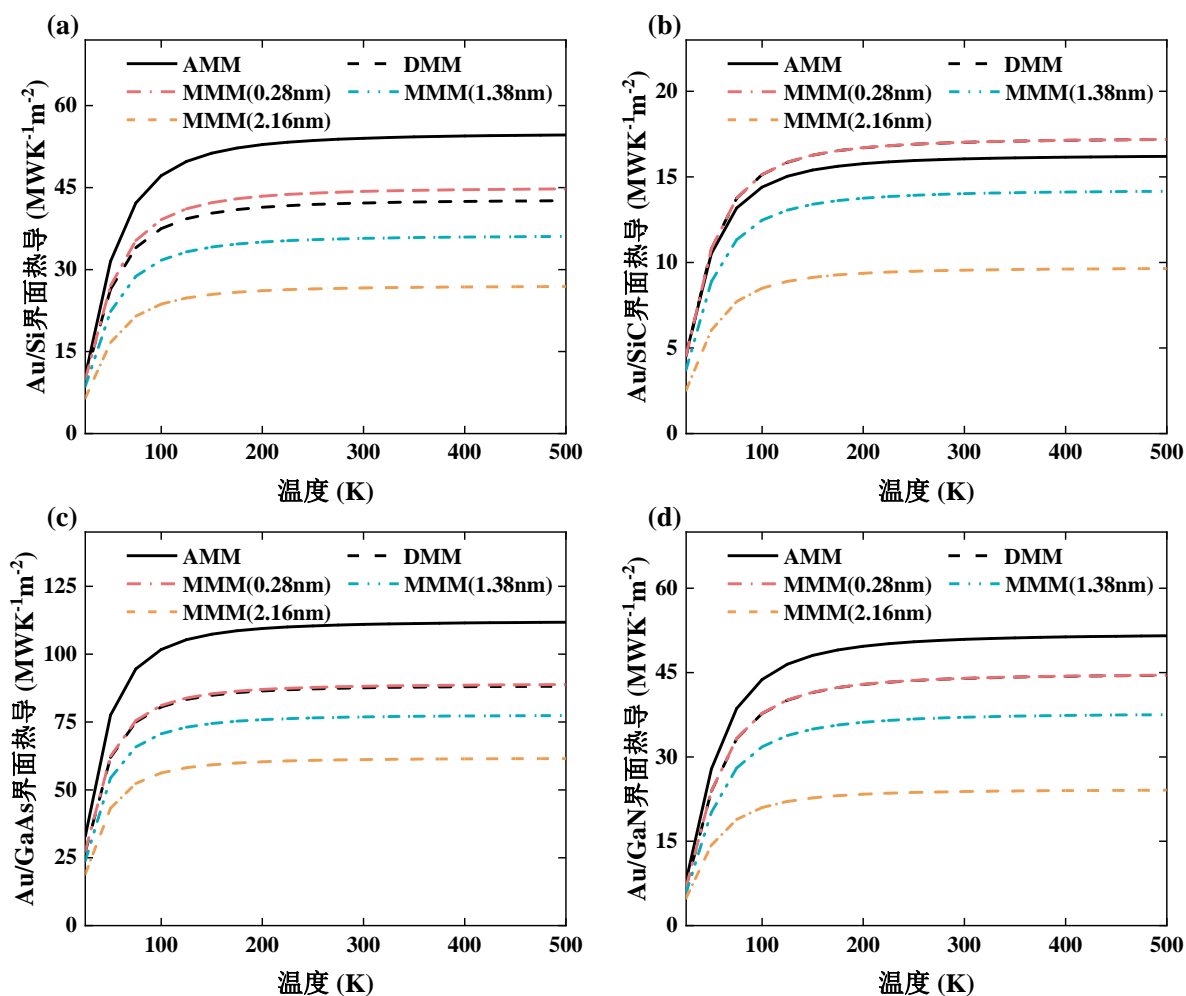


图 S6 AMM, DMM 和 MMM (粗糙度: 0.28, 1.38, 2.16 nm) 模型预测界面热导随温度的变化 (a) Au/Si 界面; (b) Au/SiC 界面; (c) Au/GaAs 界面; (d) Au/GaN 界面

Fig. S6. Curves of interface thermal conductance versus temperature, predicted by AMM, DMM and MMM (roughness: 0.28, 1.38, 2.16 nm) models for (a) Au/Si interface, (b) Au/SiC interface, (c) Au/GaAs interface, and (d) Au/GaN interface.