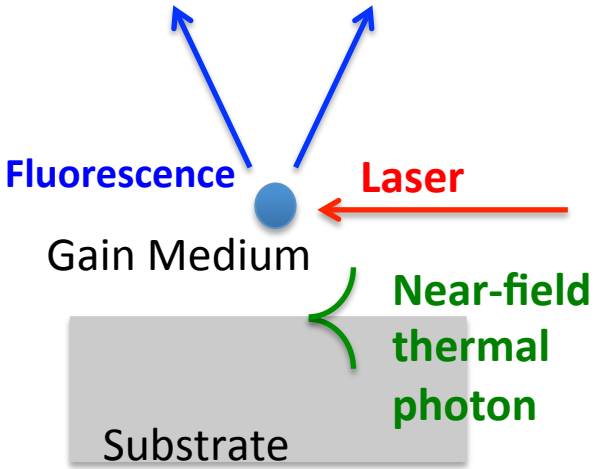
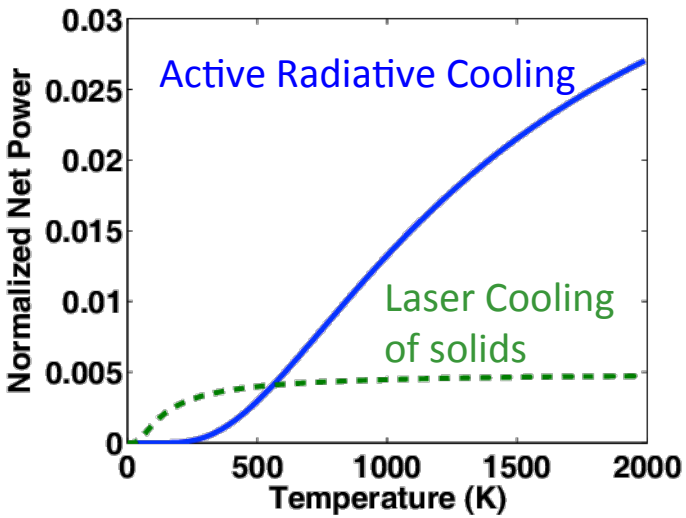
Active Thermal Extraction of Near-Field Thermal Radiation





Scientific Achievement

We have proposed and numerically demonstrated an active scheme to extract the exceptionally high energy density of surface phonon-polaritons to the far-field.

Significance and Impact

Our active radiative cooling scheme is a new approach to manipulate thermal radiation that is more widely applicable than laser cooling of solids and supports a higher theoretical heat flux.

Research Details

- Near-field thermal radiation has a nearly monochromatic spectrum and is able to effective drive atomic transitions.
- When coupled with external optical pumping, the thermal radiation allows the resonant surface mode to be emitted into the far field in an up-conversion process.
- This fluorescence carries energy away from the surface, thereby resulting in cooling.

Work was performed at Caltech

D. Ding, T. Kim, and A. J. Minnich, "Active thermal extraction of near-field thermal radiation" Phys. Rev. B 93, 081402(R) (2016)