Dust in Cassiopeia A

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Recent infrared space missions have revealed a significant amount of newly-condensed dust from supernova ejecta in the young supernova remnant (SNR) Cassiopeia A. They detected both the shocked, warm (~100 K) dust bright in mid infrared and the unshocked cool (~35 K) dust bright in far infrared. The estimated total mass amounts to ~0.1 $M_{\odot}$, but is uncertain. It is also still controversial whether there could be an additional dust component at lower temperature, which cannot be easily distinguishable from the foreground/background material.

In this talk, we present the result of near-infrared spectroscopic observations of Cassiopeia A, where we measure the extinction toward the supernova ejecta knots around the main ejecta ring using their [Fe II] line ratios. Our result shows that the extinction toward the knots at large positive velocities is systematically larger than that toward the knots at negative velocities, indicating the presence of the 'self-extinction' within the SNR presumably due to the newly-formed supernova dust. We discuss our result and its implications on the dust content of Cassiopeia A.