In my Beginning is my End:
Dust Destruction in the Cassiopeia A Supernova Remnant

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It has been demonstrated by observations that young supernovae (SNe) are indeed able to efficiently synthesize dust[1]. However, the total mass of dust estimated from observations is still orders of magnitude lower than the amount predicted by coagulation models[2, 3]. At the same time, SNe represent the major agent responsible for dust destruction[4]. Because SNe are possibly the only viable dust factory in the early Universe, it is extremely important to establish the origin of this discrepancy. It could be that the models of dust coagulation in supernova ejecta need to be revised, or that the dust is present but undetectable, due to environmental conditions or technical limitations. Our work explores a third possibility: that a significant fraction of the newly formed dust is destroyed within the supernova remnant itself.
In the Cassiopeia A supernova remnant, dust emission has been observed associated with optical knots containing recently formed material. The dust present in such clumps is threatened by the reverse shock traveling through the ejecta toward the center of the remnant. The shock is able to disrupt the clumps and will inject the dust grains into a hot gas, where they will be eroded and possibly destroyed by thermal and inertial sputtering. We present a model that describes the propagation of the reverse shock into the supernova cavity and evaluates the destruction of the newly formed dust[5]. Our model accounts for the variation of the physical properties of both the shock and the ejecta across the remnant. In particular, this means taking explicitly into consideration, for the first time in this kind of studies, the effect of clumping of the ejecta.

References

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