Connecting the high- and low-energy Universe: dust processing inside Supernova Remnants

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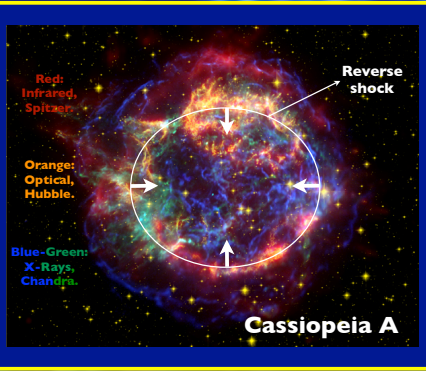
Introduction

Context: supernovae are efficient dust factories but the net amount reaching the ISM is still unknown. Such information is crucial to understand the origin and evolution of dust in the local and high-redshift Universe.

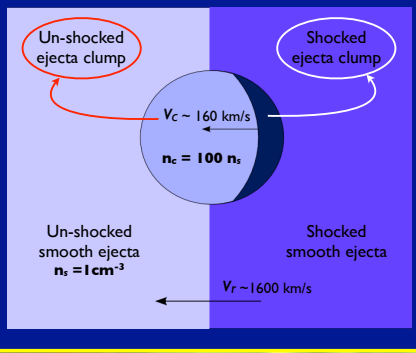
Aim: investigating dust destruction by the reverse shock inside the supernova cavity at different evolutionary stages of the remnant.

Observational facts: newly formed dust observed in ejecta clumps of Cassiopeia A. Dust in clumps encounters the reverse shock traveling through the ejecta toward the center of the supernova.

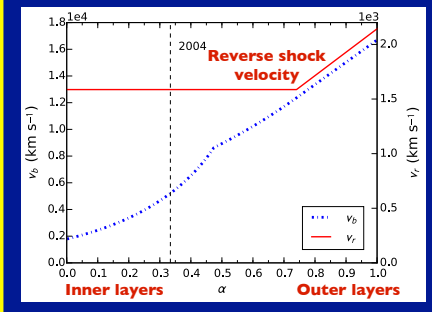
Methods: modelling the effect of the reverse shock encountering ejecta clumps, where the dust initially resides, immersed in a hot and tenuous medium.

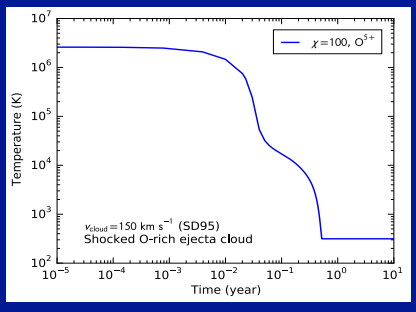


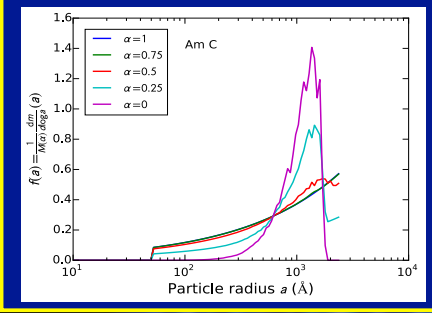
Model

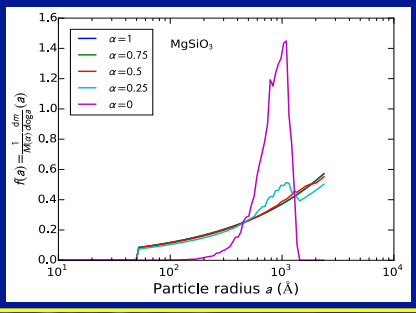


Results









Discussion

- Our model describes the propagation of the **reverse shock** and evaluates the **destruction** of the **newly formed dust**.
- We take into account the **variation** of the physical properties of both the shock and the ejecta across the remnant.
- For the first time, we include the effect of **clumpy** ejecta.
- **Oxygen-rich** clumps → **fast cooling** → low temperature → **inertial sputtering** only.
- Silicates are more affected than amorphous carbon.
- Sputtering heavily modifies dust grain distribution → **destruction**.
- The size distribution **evolves** towards a **specific** size range.

References

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