

## Evaporation of planetesimals by planetesimal bow shocks

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It has been shown that bow shocks associated with a planetesimal orbiting with supersonic velocity relative to the gas in a protoplanetary disk lead to formation of chondrules and fine crystals found in meteorites<sup>1–3</sup>. In the previous studies, attention has mainly been paid to thermal evolutions of dust particles entrained in the gas when they pass through the bow shock. In the present study, we noticed heating and evaporation of a planetesimal itself. We evaluated surface temperatures and evaporation rates of planetesimals based on the results of the previous studies of planetesimal bow shocks and formation of protoplanets. We found that icy planetesimals evaporate efficiently by bow shock heating in the stage of formation of protoplanets; in this stage strong bow shocks are produced by gravitational perturbations by the protoplanets<sup>4</sup>. Planetesimals orbiting near a protoplanet at heliocentric distance of 3AU in the Hayashi model<sup>5</sup> (minimum mass solar nebula model), for instance, evaporate completely within a few million years when a protoplanet grows to mass larger than 2 Earth-mass. Our results suggest that growth of a protoplanet is suppressed owing to insufficient accretion of planetesimals onto the protoplanet.

Keywords: Planetesimal, Shock wave, Evaporation

### References

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