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Impact-induced degassing from antigorite and carbonates: Implications to formation of planetary atmosphere TOSHIMORI SEKINE, RYUNOSUKE TACHI, KOICHI SHIBUYA, RYOUTA MIHARA, Hiroshima University, TAKAMICHI KOBAYASHI, National Institute for Materials Science — Primitive planetary atmosphere has been thought to consist mostly of H2O and CO2 of which components were present in the building blocks of planets. The degassing dymanics of these components during impacts processes is the key to understand the origin of planetary atmosphere. According to the Hugoniot measurements, antigorite and carbonates are stable as high as 40 GPa and 100 GPa, respectively. However, meteorites are porous and can be heated to high temperatures. If the residual temperatures for porous samples are high enough for them to degas, degassing can occur at or near ambient pressure. We have investigated the degassing of serpentine (antigorite) and carbonates (CaCO3 and MgCO3) by shock recovery experiments. Impact experiments on porous powders were carried out with a propellant gun and peak pressures were estimated as the equilibrium pressure as the container. Samples were investigated by XRD, TG/DTA, SEM, and TEM. The degassing from antigorite was small below 20 GPa, but became violent at 20-60 GPa, and completed at 60 GPa. The degassing from carbonates started in a narrow pressure range (35-38 GPa) and there was no evidence for the formation of MgO and CaO. The different results between antigorite and carbonates may suggest a constrain on the origin of planetary atmosphere. Atmospheric H2O can be present frequently but CO2 will be limited only in areas subjected to strong impacts.

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