Chemical and isotopic fractionation during diffusion-controlled free evaporation from a condensed phase

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Chemical fractionation of some volatile elements in chondrites and planets is not correlated with their isotopic fractionation. The phenomena has been explained by fractionation during condensation rather than during evaporation. It is supposed that any chemical fractionation is inevitably associated with isotopic fractionation in evaporation. In order to see the validity of this, we investigated the behavior of elemental and isotopic compositions of a binary condensed phase subjected to free evaporation by a diffusion-controlled model. The result shows that the chemical and isotopic fractionation measured relative to the initial composition is decoupled if a component is significantly volatile and if the evaporation is in the diffusion-controlled regime.