# Some discoveries about alloy reactions during the production of metallic Fe from (Mg,Fe)O at High-Pressure High-Temperature

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It is reported that metallic iron may exist under shallow lower mantle conditions (Frost et al., 2004). If metallic iron exists, it has an important chemical and physical impact on lower mantle materials. In our previous High-pressure High-temperature experiments, metallic iron was successfully formed in (Mg,Fe)O. However, when we used different metal-oxygen fugacity buffers, it was found that the generated metallic iron existed in the form of alloy. Iron-rich alloys with different compositions even have different physical forms, such as granular and dendritic shapes.

In the actual lower mantle, metallic iron produced from (Mg,Fe)O may also form alloys when encountering ferrous metals, and the physical and chemical properties of metallic iron are very different from those of alloys. Therefore the formation of iron-rich alloys is worth our attention.

In this study, different metal-oxygen fugacity buffers (Cr, Ti, TIC) were used to study the formation of iron-rich alloy in (Mg, Fe) O under high temperature (1573k, 1773K) and high pressure (3GPa, 15GPa). When the oxygen fugacity is lower than a certain level, metallic iron is formed, and due to the existence of metal-oxygen fugacity buffers, the formed metallic iron will be alloyed with the around metal-oxygen fugacity buffers. At the same time, a reaction zone appears between the sample zone and oxygen fugacity buffers. Martirosyan et al. (2016) also found similar experimental results. We measured the alloy composition and content, the left composition of ((Mg, Fe) O) and oxygen fugacity buffers around the sample area to understand the formation process of iron-rich alloys in our experiments. Preliminary results will be displayed and their implications discussed.