Viscosity of lunar lavas

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Viscosity is a parameter related to magma flow and mechanism of eruption, which is considered to be affected by SiO_2 and TiO_2. Lunar basalt contains more titanium and iron than Earth's volcanic rock. This is because ilmenite-rich layer was also melted together when basaltic layer beneath the crust re-melted (Shearer and Papike, 1999). Therefore, the viscosity of lunar basaltic magma is thought to be greatly influenced by TiO_2.
In this study, we measured the viscosity of three lunar volcanic glasses, Apollo 14 black glass, Apollo 15 green glass-C, and Apollo 17 orange glass (74220), and discussed the effect of composition on viscosity. Viscosity measurements were performed using a rotational viscometer in the range of 1500℃ to 1270℃ in argon.
It has been found that the viscosity of the magma decreases with increasing TiO_2 content (Zhang and Jahanshahi, 2004). However the lowest viscosity in this measurement was not Apollo 14 black glass with the highest TiO_2 content (16.4 wt%), but Apollo 17 orange glass with an intermediate TiO_2 content (9.12 wt%). TiO_2 works to reduce viscosity, but if its content exceeds a certain amount (perhaps about 10 wt%), its ability to reduce viscosity decreases, and other compositions may be more effective at reducing viscosity.

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