

SIMS Methods of Measuring Extremely Low Concentrations of H₂O and other Volatiles in Minerals and Rocks

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After the establishment of SIMS methods analyzing volatiles in silicate glasses [1], substantial achievements have been made in the determination of water in the Moon [2, 3] and volatiles in the upper mantle magmas [4, 5]. Our understanding of the formation of the Moon and the cycling of volatiles in magmas under plate tectonic settings have been greatly improved.

To push for extremely low H₂O detection limits (< 1 ppm) and smaller analyzed area (submicron), we have paid careful attention in sample preparation to obtain highest vacuum in the sample chamber. We also modified operating software to get better E-gun tuning for charge compensation and analysis automation. The instrument tuning has been consistently performed to get lowest background of H₂O as possible. Details of how to reach the lowest H₂O detection limits and reliable data will be presented at the conference.

[1] Hauri et al. 2002 *Chem. Geol.* **183**, 99-114; [2] Saal et al. 2008 *Nature* **454**, 192-195; [3] Hauri et al. 2011 *Science* **333**, 213-215; [4] Saal et al. 2002 *Nature* **419**, 451-455; [5] Workman et al. 2006 *EPSL* **241**, 932-951