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# Fluorine and Chlorine in the transition Zone

Helene Bureau <sup>\*† 1</sup>, Mathilde Roberge <sup>1</sup>, Nathalie Bolfan Casanova <sup>2</sup>,  
Geeth Manthilake <sup>2</sup>, Suzy Surblé <sup>3</sup>, Sarah Figowy <sup>1</sup>, Guillaume Fiquet <sup>1</sup>

<sup>1</sup> Institut de minéralogie, de physique des matériaux et de cosmochimie (IMPMC) – Museum National d’Histoire Naturelle, Université Pierre et Marie Curie - Paris 6 : UMR120, Institut de recherche pour le développement [IRD] : UR206, Centre National de la Recherche Scientifique : UMR7590 – Tour 23 - Barre 22-23 - 4e étage - BC 115 4 place Jussieu 75252 PARIS, France

<sup>2</sup> Laboratoire Magmas et Volcans (LMV) – Université Jean Monnet [Saint-Etienne], Institut de Recherche pour le Développement et la société : UMR163, Université Clermont Auvergne, Centre National de la Recherche Scientifique : UMR6524 – Campus Universitaire des Cézéaux, 6 Avenue Blaise Pascal, 63178 Aubière Cedex, France

<sup>3</sup> CEA Saclay (CEA) – CEA-DRF-IRAMIS – LEEL, NIMBE, CEA, CNRS, Université Paris-Saclay, CEA Saclay, 91191 Gif-sur-Yvette Cedex, France, France

We report concentrations of Fluorine (F) and Chlorine (Cl) in synthetic wadsleyite (Wd) and ringwoodite (Rw). Synthesis were performed under pressures (14–22GPa) and temperatures (1100–1400°C) relevant to the transition zone (TZ: 410–670 km depth) using multi-anvil press experiments in MLV Clermont-Ferrand, France and in BGI Bayreuth, Germany. F, Cl and H contents were measured using Particle Induced Gamma-Ray Emission (PIGE), Particle Induced X-ray Emission (PIXE) and Elastic Recoil Detection Analysis (ERDA) respectively, using a nuclear microprobe at CEA Saclay. Results show that F (up to 850 ppm wt.) and Cl (up to 200 ppm wt.) are concentrated together with H<sub>2</sub>O in both Wd and Rw (Roberge et al., 2015; 2017). Cl content in Rw and Wd is significantly higher than in other nominally anhydrous minerals of the upper mantle (olivine, pyroxene, garnet), when we found that F is also concentrated in hydrous olivine (up to 1700 ppm wt., Creppisson et al, 2014). With these data we put constraints on the F and Cl budget of the deep Earth, we propose that the TZ may be a major repository for major halogen elements in the mantle. We also show that both F and Cl abundances are underestimated for the bulk silicate Earth (BSE). We propose maximum abundances for the BSE of 59 ppm wt. F and 37 ppm wt. Cl, these abundances are higher than the values proposed by McDonough and Sun in 1995, of 25 and 17 ppm wt. respectively. New results on F-bearing ringwoodite will be presented at the meeting.

Creppisson et al., 2014. Clumped fluoride-hydroxyl defects in forsterite: implications for the upper-mantle, *EPSL* 390, 287-295.

McDonough, W.F., Sun, S., 1995. The composition of the Earth. *Chem. Geol.*120, 223–253.

Roberge et al., 2015. Is the transition zone a deep reservoir for fluorine?, *EPSL*, 429, 25-32.

Roberge et al., 2017. Chlorine in wadsleyite and ringwoodite: an experimental study, *EPSL* 467, 99-107.

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\*Speaker

†Corresponding author: helene.bureau@impmc.upmc.fr