

INVESTIGATING PETROLOGIC INDICATORS OF MAGMATIC PROCESSES IN VOLCANIC ROCK

Fe pre-enrichment: A new method to counteract iron loss in experiments on basaltic melts†

YANN-AURELIEN BRUGIER^{1,*}, MARINA ALLETTI¹ AND MICHEL PICHAVANT¹

¹Université d'Orléans, ISTO, UMR 7327, 45071, Orléans, France; and CNRS/INSU, ISTO, UMR 7327, 45071 Orléans, France; and BRGM, ISTO, UMR 7327, BP 36009, 45060 Orléans, France

ABSTRACT

Capsule pre-saturation has been traditionally employed to circumvent Fe loss from the charge to the container in petrological experiments. However, the method is time-consuming and fraught with theoretical and practical difficulties. An alternative method, based on the use of starting materials pre-enriched in Fe, is presented. Test experiments on two natural basalts, both non Fe-enriched and Fe-enriched with the addition of Fe oxides, have been carried out at 1 atm and 50 MPa (H₂O-saturated), 1200 and 1250 °C, between NNO and NNO-1 and in Pt and Au₈₀Pd₂₀ capsules. Glasses and capsules were analyzed by electron microprobe. Fe-concentrations in the capsule near the glass interface strongly depend on the capsule material, being 5–10 times less for Au₈₀Pd₂₀ than for Pt. For non Fe-enriched compositions, Fe loss reaches –15% (Au₈₀Pd₂₀) and –60% (Pt). Increasing the level of Fe-enrichment reduces Fe loss, the amount of Fe alloyed with the capsule being compensated by the amount of Fe added to the starting composition. FeO_i concentrations in high-pressure glasses bracket the nominal FeO_i of the two starting basalts, demonstrating that Fe alloying has been successfully counteracted. Combination of AuPd containers with Fe pre-enriched starting materials offers excellent perspectives to solve the Fe loss issue in high-pressure experiments on basaltic compositions.

Keywords: Experiments, capsules, iron loss, pre-enrichment, basalts