

**UNDERSTANDING THE ORIGIN OF  
PLAGIOCLASE MEGACRYSTS IN BASALTS**

J. MESA<sup>1\*</sup> R.A. LANGE<sup>1</sup>

<sup>1</sup>University of Michigan, Ann Arbor, MI, 48109

(\*correspondance: [jmesagar@umich.edu](mailto:jmesagar@umich.edu))

This study is focused on evaluating the conditions necessary to grow unusually large, yet sparse, unzoned plagioclase megacrysts (>1 cm in size) in basalts from western Mexico. Two competing hypotheses to explain the plagioclase megacrysts are evaluated in this study: (a) they are xenocrysts that were incorporated into the magma either while it stalled in a crustal chamber and/or during ascent, or (b) they crystallized under large undercooling conditions (i.e.,  $\Delta T = T_{\text{liquidus}} - T_{\text{melt}}$ ), which lead to high crystal growth rates and low nucleation rates [1]. The attainment of large effective undercoolings require rapid cooling and/or degassing, which are more likely to occur during ascent along a fractures rather than in a stalled magma chamber. There are three ways to test these two hypotheses: 1) analyse the plagioclase megacrysts to evaluate if their major element composition is consistent with equilibrium growth from the whole-rock liquid, 2) measure the distribution of incompatible elements in plagioclase megacrysts to evaluate if a skeletal texture is revealed for initial growth of these crystals, and 3) perform dynamic, crystallization experiments at high undercooling to see if large megacrysts can form over a period of days. Analyzed plagioclase megacrysts in basalts from western Mexico show textural and composition evidence of crystallization from the melt. Elemental maps of the plagioclase megacrysts are underway to further test evidence of diffusion-limited, rapid growth. Finally, two sets of phase-equilibrium experiments are being performed on 100% basaltic glass starting material: (a) bottom-up and (b) top-down temperature-path trajectories. The latter approach begins above the liquidus and eliminates nuclei prior to the attainment of large  $\Delta T$  values. The former approach takes the glass through a region of high nucleation rate on its way to a final equilibration temperature. A comparison of results will allow an assessment of whether compositional equilibrium was attained, even if textural equilibrium was not. [1] Meiling, G.S., Uhlmann, D.R. (1967) Phys. Chem. Glasses. **8**, 62.