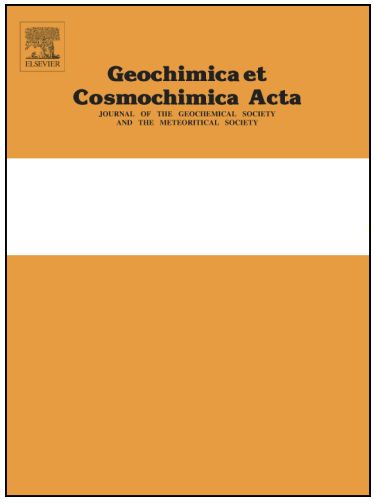

A magmatic origin for silica-rich glass inclusions hosted in porphyritic magnesian olivines in chondrules: an experimental study

François Faure, Laurent Tissandier, Léa Florentin, Karine Devineau

PII: S0016-7037(17)30048-0
DOI: http://dx.doi.org/10.1016/j.gca.2017.01.034
Reference: GCA 10128

To appear in: *Geochimica et Cosmochimica Acta*

Received Date: 2 September 2016
Revised Date: 6 January 2017
Accepted Date: 12 January 2017

Please cite this article as: Faure, F., Tissandier, L., Florentin, L., Devineau, K., A magmatic origin for silica-rich glass inclusions hosted in porphyritic magnesian olivines in chondrules: an experimental study, *Geochimica et Cosmochimica Acta* (2017), doi: http://dx.doi.org/10.1016/j.gca.2017.01.034

A magmatic origin for silica-rich glass inclusions hosted in porphyritic magnesian olivines in chondrules: an experimental study

François Faure[1,2], Laurent Tissandier[1,2], Léa Florentin[1,2], Karine Devineau[3,4]

[1]Université de Lorraine, CRPG, UMR 7358, 15 rue Notre Dame des Pauvres F-54501 Vandoeuvre-lès-Nancy France.

[2]CNRS, CRPG, UMR 7358, 15 rue Notre Dame des Pauvres F-54501 Vandoeuvre-lès-Nancy France.

[3]Université de Lorraine, GeoRessources, UMR 7359, Faculté des Sciences et Technologies rue Jacques Callot BP 70239, F-54506 Vandoeuvre-lès-Nancy Cedex France

[4]CNRS, GeoRessources, UMR 7359, Faculté des Sciences et Technologies rue Jacques Callot BP 70239, F-54506 Vandoeuvre-lès-Nancy Cedex France

Abstract

Rare silica-rich glass inclusions ($69 < SiO_2 < 82$ wt.%) are described within magnesian olivines of porphyritic Type IA chondrules. These glass inclusion compositions are clearly out of equilibrium with their host Mg-olivines and their presence within the olivines is generally attributed to an unclear secondary process such as a late interaction with nebular gases. We performed dynamic crystallisation experiments that demonstrate that these Si-rich glass inclusions are actually magmatic in origin and were trapped inside olivines that crystallized slowly from a magma with a CI, i.e. solar, composition. Their silica-rich compositions are the consequence of the small volumes of inclusions, which inhibit the nucleation of secondary crystalline phase (Ca-poor pyroxene) but allow olivine to continue to crystallize metastably on the walls of the inclusions. We suggest that Si-rich glass inclusions could be the only reliable relicts of what were the first magmas of the solar system, exhibiting a CI, i.e. non-fractionated, composition.