High-pressure elastic properties of synthetic $(Mg,Fe^{2+})Al_2O_4$ spinel crystals by Brillouin spectroscopy

G.B. ANDREOZZI[1]*, E. BRUSCHINI[1], S. SPEZIALE[2], H.J. REICHMANN[2] AND F. BOSI[1]

[1]Department of Earth Sciences, Sapienza University of Rome – Piazzale Aldo Moro 5, 00184, Rome, Italy (*correspondence: gianni.andreozzi@uniroma1.it)

[2]GFZ, German Research Centre for Geosciences – Telegrafenberg,14473 Potsdam, Germany

Fe-bearing spinels are widespread accessory minerals in Upper Mantle rock assemblages and are one of the most common inclusions found in diamonds. We studied, by Brillouin spectroscopy in a diamond anvil cell up to 10 GPa, high-pressure elastic properties of two synthetic aluminate spinel crystals with low and high Fe^{2+}-contents. Their structural formulae, as determined by XRD EMPA and MS, are: $^{IV}(Mg_{0.74}Fe^{2+}_{0.02}Al_{0.24})_{\Sigma=1.00}{}^{VI}(Al_{1.76}Mg_{0.24})_{\Sigma=2.00}O_4$ for sample He2d, and $^{IV}(Mg_{0.36}Fe^{2+}_{0.42}Fe^{3+}_{0.03}Al_{0.19})_{\Sigma=1.00}{}^{VI}(Al_{1.77}Mg_{0.16}Fe^{2+}_{0.07})_{\Sigma=2.00}O_4$ for sample He6a.

High-pressure data were fitted using the third order Eulerian finite strain equations (Figure 1).

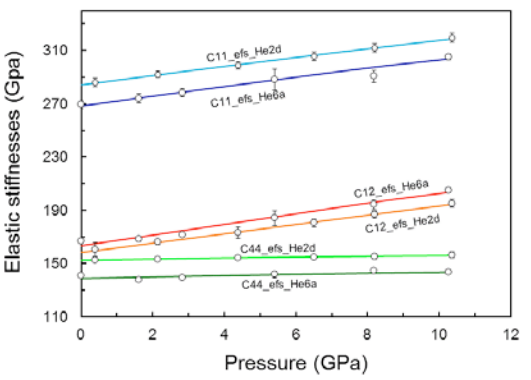

Figure 1: Pressure dependence of elastic moduli for spinel samples He2d and He6a.

For both samples all the elastic moduli increase as a function of pressure with approximately the same derivatives, and such a similarity suggests that different Fe^{2+} contents have little influence on the elasticity of aluminate spinels at Upper Mantle pressure. Our data are in good agreement with literature data on oxide and silicate spinels as for the elastic moduli, but are often distinctly lower concerning their derivatives as a function of pressure.