American Mineralogist, Volume 101, pages 1228–1231, 2016

LETTER

The elastic tensor of monoclinic alkali feldspars

NAËMI WAESELMANN[1,*], J. MICHAEL BROWN[1], ROSS J. ANGEL[2], NANCY ROSS[3], JING ZHAO[3], AND WERNER KAMINSKY[4]

[1]Department of Earth and Space Sciences, University of Washington, 4000 15th Avenue NE, Seattle, Washington 98195-1310, U.S.A.
[2]Department of Geosciences, University of Padova, Via G. Gradenigo 6, I-35131 Padova, Italy
[3]Department of Geosciences, Virginia Tech, 4044 Derring Hall (0420), Blacksburg, Virginia 24061, U.S.A.
[4]Department of Chemistry, University of Washington, 36 Bagley Hall, Seattle, Washington 98195-1700, U.S.A.

ABSTRACT

The full elastic tensors of two K-rich monoclinic alkali feldspars, $Or_{83}Ab_{15}$ sanidine and $Or_{93}Ab_7$ orthoclase, have been determined by using the Impulse Stimulated Light Scattering technique to measure surface acoustic wave velocities. The new data confirm that alkali feldspars exhibit extreme elastic anisotropy, so the bounds of their isotropic average properties span a wide range. The measured adiabatic moduli are, for $Or_{83}Ab_{15}$ and $Or_{93}Ab_7$, respectively, K_{Reuss} = 54.7(7), 54.5(5) GPa; K_{Voigt} = 62.9(1.1), 64.4(0.6) GPa; G_{Reuss} = 24.1(1), 24.5(1) GPa; and G_{Voigt} = 36.1(5), 36.1(7) GPa. The small differences in moduli between the samples suggests that variations in composition and in state of Al, Si order only have minor effects on the average elastic properties of K-rich feldspars. The new measurements confirm that the earliest determinations of elastic wave velocities of alkali feldspars, widely used to calculate wave velocities in rocks, resulted in velocities systematically and significantly too slow by 10% or more.

Keywords: Alkali feldspar, elastic tensor, impulse stimulated light scattering