

LETTERS

An assessment of nuclear microprobe analyses of B in silicate minerals

HENRIK SKOGBY,^{1,*} PER KRISTIANSSON,² AND ULF HÅLENIUS¹

¹Department of Mineralogy, Swedish Museum of Natural History, Box 50007, SE-104 05 Stockholm, Sweden

²Department of Nuclear Physics, Lund Institute of Technology, Box 118, SE-221 00 Lund, Sweden

ABSTRACT

With recent findings of substantial amounts of B in rock-forming minerals, it has become evident a need exists for microprobe techniques allowing quantitative B determinations in minerals. A microprobe method based on the nuclear reaction $^{11}\text{B}(p,\alpha)2\alpha$ has the potential to become a powerful tool for analyses of minerals with B contents spanning a wide concentration range. In this paper, we present nuclear microprobe analyses of B in a set of silicate minerals containing stoichiometric concentrations of B in the range 1.9–8.8 wt%. Our results strongly indicate that nuclear reaction analyses of silicates utilizing the $^{11}\text{B}(p,\alpha)2\alpha$ nuclear reaction are virtually matrix-insensitive, and saturation effects are negligible within the studied range of B concentrations. This finding suggests that it is adequate to use a single B standard for calibration purposes for analyses covering wide ranges of B concentrations in silicates. In addition, we demonstrate how B-concentration maps of high contrast and resolution may be produced by scanning the proton beam over the samples.