

LETTER

**Novel 2:1 structure of phyllosilicates formed by annealing Fe<sup>3+</sup>, Mg-rich dioctahedral mica**

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ABSTRACT

A new modification of the 2:1 phyllosilicate layer has been discovered in annealed celadonite, a Fe<sup>3+</sup>, Mg-rich dioctahedral mica. Plan-view diffraction patterns in TEM indicate a base-centered supercell with  $A = 3a$  and  $B = b$ , where  $a$  and  $b$  are the cell dimensions of the original mica. Basic  $h0l$  reflections with  $h = 3n$  form an orthogonal lattice with one-layer periodicity, which is not expected for normal micas. The high-resolution TEM image along the  $\langle 100 \rangle$  or related directions is similar to that expected from normal micas but the image along the  $\langle 010 \rangle$  directions is completely different. From these images, it is concluded that the two tetrahedral sheets in a 2:1 layer are facing each other with no lateral  $a/3$  stagger. In the proposed model that explains the high-resolution TEM images, two thirds of the spaces surrounded by two facing tetrahedral six-member rings accommodate three (Fe<sup>3+</sup>,Mg) cations and one third of the spaces are completely vacant. The (Fe<sup>3+</sup>,Mg) cations are coordinated by six or five oxygen atoms forming trigonal prisms or square pyramids, respectively.

**Keywords:** Crystal structure, electron microscopy, electron diffraction, mica, phase transition, phyllosilicates