American Mineralogist, Volume 99, pages 1653–1661, 2014

Sepiolite-palygorskite polysomatic series: Oriented aggregation as a crystal growth mechanism in natural environments

Emilia García-Romero[1,2,*] and Mercedes Suárez[3]

[1]Departamento de Cristalografía y Mineralogía, Universidad Complutense de Madrid, 28040 Madrid, Spain
[2]Instituto de Geociencias (UCM-CSIC), 28040 Madrid, Spain
[3]Departamento de Geología. Universidad de Salamanca, 37008 Salamanca, Spain

Abstract

A detailed microscopic study of sepiolite and palygorskite natural samples reveals that independently of the fiber length they all are composed of other minor width fibers until the minor units or the true crystals. They are prismatic crystals elongated along [001] with rhombus-like morphology in cross section, designated laths. Although their length can vary greatly, their width is always nanometric (~10–30 nm). The laths are grouped in a crystallographic arrangement, sharing edges or faces forming rods. Several rods, parallel to the *c*-axis of the fiber, form bundles. The laths are the smallest stable nucleated crystals. After the nucleation, the process of growth continues via a nonclassic crystal growth mechanism (aggregation of the nanolaths). Subsequently, the aggregated sepiolite and palygorskite natural crystals can continue growing, along the *c*-axis at the expense of the diffusion of molecular scale species throughout the solution. The morphology of the faces is controlled by the highly different attachment energy of the faces.

Keywords: Sepiolite, palygorskite, polysomatic series, nonclassic nucleation, oriented aggregation, mesocrystals, electron microscopy, crystal growth