INTRODUCTION

The hydrated Al-phosphate variscite (AlPO₄·2H₂O, orthorhombic) was discovered by Breithaupt (1837) as crusts on aluminous rocks of Vogtland, Germany and named for Variscia, the ancient name of the Vogtland district. Variscite and its polymorph metavariscite (AlPO₄·2H₂O, monoclinic) are relatively rare minerals that form via reaction of P-bearing solutions with Al-rich rocks in near-surface environments. Natural variscite is observed in soils and weathered aluminous rocks, where it occurs as fine-grained masses in nodules, cavity fillings, and crusts. Prominent examples of natural variscite occurrences include: (1) variscite-rich aluminophosphatic crusts on volcanic rocks formed under intense weathering from guano and basalt from Bahia, Brazil (Flicoteaux and Melosi 2000); (2) variscite-rich nodules in limonite limestone from Fairfield, Utah (Larsen and Shannon 1930; Larsen 1942), presumably formed by the circulation of heated groundwater during the emplacement of a rhyolite stock (Jewell and Parry 1987); (3) variscite fracture fillings in a sedimentary rocks from Pannecé, France (Forestier and Lasnier 1973); (4) variscite in biogenic, phosphate-rich soils in caves (e.g., Fiore and Laviano 1991); and (5) secondary vein and cavity fillings in the Sapucaia pegmatite of Minas Gerais, Brazil (Cassendeane and Baptistia 1999). Natural metavariscite (AlPO₄·2H₂O, monoclinic), on the other hand, has been only identified as a minor constituent of the variscite-rich nodules in limonite limestone from Fairfield, Utah (Calas et al. 2005).

Both variscite and metavariscite are usually deposited with other secondary phosphate minerals, like apatite, wavellite, and cran-dallite (Larsen 1942). Variscite and other hydrated Al-phosphates are of great importance for soil science, since their formation strongly reduces the effectiveness of phosphate fertilizers by the fixation of the phosphate to Al(OH)₃-containing soil components. On the other hand, this effect can be used for the purification of P-containing waste-water.

Industrial applications of variscite are mainly based on its capacity to loose water on heating, being converted into berlinite (Kotova and Ivanov 2000), with the structure of tridymite and cristobalite (Flörke 1967; Hensel et al. 2007). Berlinite, on the other hand, is of interest for application in refractories, ceramics, and insulating surface coatings because of its piezoelectric and dielectric properties, thermal stability, insolubility, and chemical inertness (e.g., Flörke 1967; Kolb et al. 1981; Hemingway et al. 1992; Fontanella et al. 1993). A minor aspect is the use of natural,