

Negevite, the pyrite-type NiP₂, a new terrestrial phosphide

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ABSTRACT

Negevite, ideally NiP₂, is a new phosphide mineral from pyrometamorphic complex of the Hatrurim Formation (the Mottled Zone), Southern Levant. It is found in phosphide assemblages of the Hatrurim Basin, south Negev Desert, Israel, and Daba-Siwaqa complex, Jordan. The mineral occurs as tiny isometric grains reaching 15 μm in size and forms intimate intergrowths with other phosphides related to the Fe-Ni-P system. In reflected light, negevite is white with yellowish tint and isotropic. Reflectance values for COM recommended wavelengths [*R* (%), λ (nm)] are as follows: 54.6 (470), 55.0 (546), 55.3 (589), 55.6 (650). Chemical composition of the holotype specimen (electron microprobe, wt%): Ni 42.57, Co 3.40, Fe 2.87, P 42.93, S 8.33, total 100.10, corresponding to the empirical formula (Ni_{0.88}Co_{0.07}Fe_{0.06})_{Σ1.01}(P_{1.68}S_{0.31})_{Σ1.99}. The crystal structure of negevite was solved and refined to *R*₁ = 1.73% based on 52 independent observed [*I* > 2σ(*I*)] reflections. The mineral is cubic, space group *P* $\bar{a}3$, *a* = 5.4816(5) Å, *V* = 164.71(3) Å³, and *Z* = 4. *D*_x = 4.881(1) g/cm³ calculated on the basis of the empirical formula. Negevite is a first natural phosphide belonging to the pyrite structure type. It is a chemical and structural analog of vaesite, NiS₂, krutovite, NiAs₂, and penroseite, NiSe₂. The well-explored catalytic and photocatalytic properties of a synthetic counterpart of negevite could provide new insights into the possible role of higher phosphides as a source of low-valent phosphorus in prebiotic phosphorylation processes.

Keywords: NiP₂, negevite, nickel phosphide, Fe-Ni-P system, pyrite, crystal structure, pyrometamorphism, prebiotic phosphorylation, meteorite