Hingganite-(Nd)

\( \text{Nd}_2\Box\text{Be}_2\text{Si}_2\text{O}_8(\text{OH})_2 \)

Crystal Data: Monoclinic. \textit{Point Group:} 2/m. \ As zones to \( \sim 1 \text{ mm}^2 \) in prismatic crystals to \( 0.7 \text{ cm} \),
intergrown with Hingganite-(Y).

Physical Properties: Cleavage: None. \textit{Tenacity:} Brittle. \textit{Fracture:} Conchoidal. \textit{Hardness = 5.5-6}
\( \text{VHN} = 638-746, 685 \text{ average (100 g load). D(meas.) = n.d. D(calc.) = 4.690} \text{ Nonfluorescent.} \)

Optical Class: Biaxial (+). \( \alpha = 1.746(5) \beta = 1.766(5) \gamma = 1.792(6) \) \( 2\text{V(meas.)} = 80(7)^\circ \)
\( 2\text{V(calc.)} = 84^\circ \) \( \) Non-pleochroic.

Cell Data: \textit{Space Group:} \( P2_1/c. \ a = 4.7719(1) \ b = 7.6422(2) \ c = 9.9299(2) \) \( \beta = 89.851(2)^\circ \) \( Z = 2 \)

X-ray Powder Pattern: Zagi Mt., near Kafoor Dheri, Khyber Pakhtunkhwa, Pakistan.
4.773 (100), 6.105 (95), 2.573 (89), 2.864 (87), 3.122 (68), 3.028 (61), 3.462 (58)

Chemistry:

\[
\begin{array}{ccc}
\text{BeO} & 9.64 & \text{Gd}_2\text{O}_3 \\
\text{CaO} & 0.45 & \text{Tb}_2\text{O}_3 \\
\text{MnO} & 0.10 & \text{Dy}_2\text{O}_3 \\
\text{FeO} & 3.03 & \text{Ho}_2\text{O}_3 \\
\text{B}_2\text{O}_3 & 0.42 & \text{Er}_2\text{O}_3 \\
\text{Y}_2\text{O}_3 & 8.75 & \text{Tm}_2\text{O}_3 \\
\text{La}_2\text{O}_3 & 1.63 & \text{Yb}_2\text{O}_3 \\
\text{Ce}_2\text{O}_3 & 12.89 & \text{Lu}_2\text{O}_3 \\
\text{Pr}_2\text{O}_3 & 3.09 & \text{Th}_2\text{O}_3 \\
\text{Nd}_2\text{O}_3 & 16.90 & \text{Si}_2\text{O}_2 \\
\text{Sm}_2\text{O}_3 & 5.97 & \text{H}_2\text{O} \\
\text{Eu}_2\text{O}_3 & 1.08 & \text{Total} \\
\end{array}
\]

(1) Zagi Mt., near Kafoor Dheri, Khyber Pakhtunkhwa, Pakistan; average electron microprobe, IR
and Raman spectroscopic analyses, BeO, B\( _2\)O\( _3 \), and Lu\( _2\)O\( _3 \) by LA-ICP-MS; H\( _2\)O calculated by
stoichiometry; corresponds to (Nd\( _{0.515}\)Ce\( _{0.401}\)Y\( _{0.395}\)Sm\( _{0.175}\)Gd\( _{0.145}\)Pr\( _{0.096}\)Dy\( _{0.068}\)La\( _{0.051}\)Ca\( _{0.041}\)Eu\( _{0.031}\)
Er\( _{0.022}\)Tb\( _{0.014}\)Yb\( _{0.011}\)Ho\( _{0.009}\)Tm\( _{0.003}\)Lr\( _{0.003}\)Lu\( _{0.001}\))\( Z = 1.979(6) \text{ atoms/cell} \)
\( \Box \text{Fe}^2+ \) requires BeO 9.54, Nd\( _2\)O\( _3 \) 64.13,
Si\( _2\)O\( _2 \) 22.90, and H\( _2\)O 3.43, Total 100.

Mineral Group: Gadolinite supergroup, gadolinite group.

Occurrence: In weathered alluvium from gneissic alkaline A-type granite.

Association: Hingganite-(Y), aegirine, microcline, fergusonite-(Y), zircon.

Distribution: From Zagi Mountain, near Kafoor Dheri, \(-4 \text{ km south of Warsak and 30 km}
\) northwest of Peshawar, Khyber Pakhtunkhwa Province, Pakistan.

Name: The suffix indicates an analogue of \textit{hingganite-(Y)}, \textit{hingganite-(Yb)}, and \textit{hingganite-(Ce)},
but with Nd dominant among the rare earth elements.

Type Material: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow,
Russia (5370/1; 96591).

References: (1) Kasatkin, A.V., F. Nestola, R. Škoda, N.V. Chukanov, A.A. Agakhanov, D.I.
Belakovskiy, A. Lanza, M. Holá, and M.S. Rumsey (2020) Hingganite-(Nd), Nd\( _2\)\( \Box \text{Be}_2\text{Si}_2\text{O}_8(\text{OH})_2 \), a