Yusupovite  \( \text{Na}_2\text{Zr(Si}_6\text{O}_{15})(\text{H}_2\text{O})_3 \)  

Crystal Data: Monoclinic.  \( \text{Point Group: } 2\text{m} \). As prismatic crystals to 2 mm.

Physical Properties:  \( \text{Cleavage: } \text{Perfect on } \{110\}. \text{Fracture: } \text{Splintery. \ Tenacity: } \text{Brittle.} \)  
Hardness = 5  \( D(\text{meas.}) = 2.69(2) \)  \( D(\text{calc.}) = 2.713 \)

Optical Properties:  \( \text{Transparent. \ Color: Colorless. \ Streak: White. \ Luster: Vitreous.} \)  
\( \text{Optical Class: } \text{Biaxial (+). \ } \alpha = 1.563(2) \)  \( \beta = 1.565(2) \)  \( \gamma = 1.577(2) \)  \( 2V(\text{meas.}) = 42(3)^\circ \)  
\( 2V(\text{calc.}) = 45^\circ \)  \( \text{Dispersion: Strong; } r > v. \)

Cell Data:  \( \text{Space Group: } C2/m. \)  
\( a = 14.5975(4) \)  \( b = 14.1100(4) \)  \( c = 14.4394(4) \)  
\( \beta = 90.0399(4)^\circ \)  \( Z = 8 \)

X-ray Powder Pattern:  \( \text{Darai-Pioz glacier, Tien-Shan Mountains, Tajikistan.} \)  
7.05 (100), 3.24 (96), 3.10 (69), 5.13 (53), 6.51 (42), 3.17 (34), 2.941 (27)

Chemistry:  
\begin{align*}
\text{Nb}_2\text{O}_5 & \quad 0.39 \\
\text{SiO}_2 & \quad 58.84 \\
\text{ZrO}_2 & \quad 16.55 \\
\text{HfO}_2 & \quad 0.30 \\
\text{FeO} & \quad 0.01 \\
\text{Y}_2\text{O}_3 & \quad 3.05 \\
\text{Cs}_2\text{O} & \quad 2.58 \\
\text{K}_2\text{O} & \quad 0.95 \\
\text{Na}_2\text{O} & \quad 8.91 \\
\text{H}_2\text{O} & \quad [7.40] \\
\text{Total} & \quad 98.98
\end{align*}

(1)  \( \text{Darai-Pioz glacier, Tien-Shan Mountains, Tajikistan; average of } 10 \text{ electron microprobe analyses supplemented by FTIR spectroscopy, } \text{H}_2\text{O} \text{ calculated from structure; corresponding to} \)  
\( (\text{Na}_{1.78}\text{K}_{0.12}\text{Cs}_{0.11})_{2.199}(\text{Zr}_{0.80}\text{Y}_{0.17}\text{Nb}_{0.02}\text{Hf}_{0.01})_{2.012}(\text{Si}_{6.01}\text{O}_{15.98})(\text{H}_2\text{O})_{2.52}. \)

Polymorphism & Series:  \( \text{Dimorph of elpidite.} \)

Occurrence:  \( \text{In glacial moraine derived from an alkaline igneous complex.} \)

Association:  \( \text{Reedmergnerite, quartz, pectolite, zeravshanite, mendeleevite-(Ce), fluorite, leucosphenite, a pyrochlore-group mineral, neptunite, telyushenkoite, moskvinite-(Y), shibkovite.} \)

Distribution:  \( \text{From the Darai-Pioz glacier, upper reaches of the Darai-Pioz River, Alaisky mountain ridge, Tien-Shan Mountains, Tajikistan.} \)

Name:  \( \text{Honors Rustam Gumirovich Yusupov (b. 1935), a Uzbek mineralogist and curator at the Geological Museum, Tashkent, Uzbekistan.} \)

Type Material:  \( \text{A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (4543/1).} \)