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# X-Ray Identification of One-Layer Illite Varieties: Application to the Study of Illites around Uranium Deposits of Canada

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**Abstract:** Structural and diffraction criteria for distinguishing between t-1M, c-1M, m-1M, and 3T illite varieties are described. The t-1M illite corresponds to a one-layer monoclinic structure with vacant trans-sites. The c-1M illite has vacant cis-octahedra forming one of two symmetrically independent point systems; the other cis-octahedra as well as the trans-octahedra are occupied; and the m-1M illite corresponds to the structure in which cations are statistically distributed over available trans- and cis-sites. For t-1M, c-1M, and m-1M, the values of  $|c \cos \beta/a|$  are equal to 0.39– 0.41, 0.29– 0.31, and 0.333, respectively. Application of these criteria demonstrates that illite samples described in the literature as the 3T polytype usually are c-1M instead. The relatively common occurrence of c-1M illite in association with t-1M and 2M<sub>1</sub> polytypes has been recognized in illite from hydrothermal alterations around uranium deposits located in the Athabasca basement (Saskatchewan, Canada). The c-1M illite from these deposits was previously described as 3T one.

**Key Words:** Hydrothermal alteration • Illite • Octahedral cation distribution • Polytype • Uranium deposits • Vacant cis-sites • Vacant trans-sites

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