

Topological relations in the U-Si-O-H system derived by weathering at Lagoa Real Province, Bahia, Brazil

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The Lagoa Real Uranium Province besides the economic uraninite deposits holds thermodynamically interesting association of secondary and weathering-derived hydrated silicates and oxides minerals. These minerals can be arranged in isobaric, isothermal, qualitative, chemical potential diagrams (μSiO_2 - $\mu\text{H}_2\text{O}$) and showing the equilibrium and stability condition of the existent minerals found by us and by the several investigators in the past. The alteration U-minerals can be grouped into two main series: Orthorhombic and Monoclinic and also some Triclinic minerals distributed in both series. X-ray powder data to recognize the minerals have been done in UFRJ and CBPF diffractometers. It is interesting to notice that minerals from the Orthorhombic Series are reddish orange and the ones from the Monoclinic Series are yellow. On the other hand in a triangular U-Si-O diagram it could be discriminated two series of uranium minerals: Orthorhombic Series (mostly oxides) and Monoclinic Series (mostly hydrated silicates). The Orthorhombic consists of curite, fourmarierite, billietite, ianthinite, becquerelite, vandendrisscheite, schoepite, agrienierite, wolsendorfite, compreignacite, soddyite and the Monoclinic consisting of masuyite, studtite, swamboite, weeksite boltwoodite, sklodowskite, haweeite, uranophane, kasolite, gastunite, sayrite, uranosphaerite, protasite, rameauite. Some triclinic minerals also plot close to the orthorhombic field such as the richetite, clarkeite, bauranoite, vandenbrandeite.

The μSiO_2 - $\mu\text{H}_2\text{O}$ diagram show the coexistence between uraninite or pechblende at the lower $\mu\text{H}_2\text{O}$ field being transformed into soddyite, uranophane and boltwoodite under moderate increase of $\mu\text{H}_2\text{O}$ and into haiweeite under higher μSiO_2 situation and into becquerelite under low μSiO_2 condition. Increasing both μSiO_2 - $\mu\text{H}_2\text{O}$, kasolite, schoepite and sklodowskite would be stable. In conclusion the weathering-derived U-minerals, mostly from Cachoeira Mine may be grouped into two series and the ones more abundantly occurring in the area could be arranged in a μSiO_2 - $\mu\text{H}_2\text{O}$ diagram in order to understand the alteration pattern and equilibrium conditions. The reactions interesting the chemical potential diagram follow:...

see attachment

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