

**Poplar salt, biogenic minerals found at the cut section of *Populus diversifolia* around desert area, Xinjiang, NW China  
-Its formation mechanism and physiological features of salt tolerance-**

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**Summary**

*Populus diversifolia* (*Populus euphratica*) is a halo-tolerant plant, known as predominant vegetation on the flood lands in desert peripheries in Xinjiang, NW China. The name comes from their diversiform leaves. A white-colored, massive salt material named poplar salt is produced at the mechanically damaged part as well as the cut section of branches.

We collected poplar salts at the river basin of Tarim River at Luntai area in northern periphery of Tarim Basin, and at Kuitun area in south-western part of Zhungar Basin, NW China. Mineralogical and chemical studies revealed that the poplar salts are composed of various kinds of carbonate and hydrogen carbonate of alkaline and alkaline earth elements.

Potassium magnesium hydrogen carbonate hydrate [ $\text{KHCO}_3 \cdot \text{MgCO}_3 \cdot 4\text{H}_2\text{O}$ ] was found as one of the major components of the poplar salt. It occurs as small colorless and transparent crystals, platy and columnar in shape and ranging from a few microns up to 100  $\mu\text{m}$  in size, coexisting with sylvite [KCl], lansfordite [ $\text{MgCO}_3 \cdot 5\text{H}_2\text{O}$ ], dypingite [ $4\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 5\text{H}_2\text{O}$ ], calcite [ $\text{CaCO}_3$ ], monohydro-calcite [ $\text{CaCO}_3 \cdot \text{H}_2\text{O}$ ], natrite [ $\text{Na}_2\text{CO}_3$ ], thermonatrite [ $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ ], nahcolite [ $\text{NaHCO}_3$ ] and gaylussite [ $\text{Na}_2\text{CO}_3 \cdot \text{CaCO}_3 \cdot 5\text{H}_2\text{O}$ ]. This is the first occurrence of  $\text{KHCO}_3 \cdot \text{MgCO}_3 \cdot 4\text{H}_2\text{O}$  in natural environment, and we named this biomineral as kuitunite after Kuitun City, where the poplar salt was collected.

Crystallographic parameters, chemical composition, physical and optical properties were determined and the results were consistent with those of synthetic ones. Infrared absorption spectra of kuitunite are very similar to that of trona [ $\text{NaHCO}_3 \cdot \text{Na}_2\text{CO}_3 \cdot 2\text{H}_2\text{O}$ ]. Thermal analysis showed a strong endothermic peak at 95°C corresponding to the amorphization.

There are three possibilities about the origin of carbonate and hydrogen carbonate ions of kuitunite: 1. *Populus diversifolia* takes carbonate and hydrogen carbonate ions from groundwater and secretes them from its salt glands. 2. Some organic compounds such as oxalates decompose to carbonate or hydrogen carbonates. 3. When secreted sap is exposed to the air, organic acid is decomposed and the excess alkaline and alkaline earth elements absorb carbon dioxide from the atmosphere. Our experimental results support the third possibility as the most likely origin.