THE COMPONENTS OF THE SALINE LAKE IN XIZANG AND AN APPROACH TO THEIR ORIGIN*

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Abstract

Component data of the saline lakes in Xizang were obtained from field observations in recent years (1976, 1978). Laboratory studies show that there are nearly 37 chemical components in 63 lakes' brine and 27 evaporative minerals in nearly 40 saline lakes that reach their depositional stage. Their formative conditions, distributive properties, assemblage properties of some salt minerals, and mechanisms affecting the components of the saline lakes are discussed. A sedimentary model of the early Holocene epoch saline lake is suggested. This work is an aid not only to the understanding of the formation of the saline lakes in the said area, but also to the use of their mineral resources.

The saline lakes in Xizang spread out like stars. Their components are complicated, and are especially enriched in lithium and boron, elements seldom seen elsewhere in the world\(^1,2,7,8\). The significance of the investigation of these lakes' components and the probe into their origin, is that an understanding of the basic laws of China's saline lakes will lead to a better utilization of their salt resources. This investigation also enables us to study plateau uplift and geological changes in the natural environment.

I. THE DISTRIBUTION OF THE SALINE LAKES

The saline lakes in Xizang lie in a district north of Xizang Plateau, approximately between 78°–92°E and 30°–36°N (south of the Kunlun mountains and north of the Gansu–Nianqingtanggula mountains). However, in southern Xizang, there are only a few saline lakes\(^1\) (Fig. 1). According to statistics\(^3\), there are more than 220 saline lakes in the district, with a total area of more than 6000 km\(^2\), about 22.22% of the total area of the lakes in these regions. Of these saline lakes, 39 are greater than 50 km\(^2\) in area, totalling 4100 km\(^2\), or 68% of the total lake area in Xizang. The average water surface level of these saline lakes is more than 4500 m above sea level. Some are more than 5000 m above sea level.

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1) Data from Nanjing Institute of Geography, Academia Sinica. Cuochuolong Lake is a saline lake whose mineralized extent is 154.099 g/l.
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2) From the Table of Lake Types in Xizang Plateau by Institute of Saline Lakes, Academia Sinica, 1980
Lake is the biggest saline lake. It has an area of more than 560 km², and a height of more than 4689 m above sea level. Qinghe Lake with an area of 57 km², is the highest saline lake, being 5104 m above sea level. At present on the spot investigation, East–Cuoni Lake is the deepest saline lake with a water depth of 58.7 m, an area of 66.5 km², and a height of 4902 m above sea level.

![Fig. 1 The distribution of the saline lakes in Xizang](image)

1—saline lake, 2—freshwater lake.

II. THE COMPONENTS OF BRINE

The brine of the saline lakes in Xizang is divided into two types, surface brine and intercrystal brine. Among these saline lakes, the amounts of brine reserves are very different. For instance, in Gaerkunsha Lake there is no surface brine and the intercrystal brine is scarce. On the other hand, the Cuoni Lakes (both the eastern lake and the western one), the deepest known saline lakes, are full of surface brine. However, in the majority of saline lakes, surface brine is shallow, as the water depth is 1 m. Some saline lakes are even always partially dried up. The above-mentioned brine is colourless and odourless, almost transparent, salty or salty–bitter to the taste, alkaline, pH 7—9.3, gravity 1.030—1.329, mineralized extent 50—350 g/l, maximum 365 g/l. According to analysis\(^{[7,8]}\) the brine contains 37 chemical components without hydrogen and oxygen (Table 1).

The content of these components in the brine is very distinct. For instance, the sodium content is 61607 mg/l, but the tin content is only 0.0044 mg/l. The difference in value is a multiple of \(14 \times 10^8\). In Table 1, the content of cation (\(\text{Na}^+, \text{K}^+, \text{Mg}^{2+}\) and \(\text{Ca}^{2+}\)) and anion

\(^{1)}\) Data taken from an on the spot investigation in 1976 by Nanjing Institute of Geography, Academia Sinica.