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Analysis of Sedimentary Environments and Mineral Resources Near The BeiBu Gulf of The South China Sea

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Abstract. Heavy mineral characteristics of 68 surface sediment samples collected from the TieShan harbor were analyzed in detail. It shows that light minerals were dominated by quartz, heavy minerals of the TieShan harbor were characterized by relatively high contents of tourmaline, zircon, ilmenite. limonite also take up a certain amount. According to mineral source, it can be divided into terrigenous rock, authigene and biodetritus. The tidal velocity affect varied content of heavy minerals, the general trend of silt transport in TieShan harbor is roughly from northeast to southwest. At the meantime, there are different positions are rich in zircon and ilmenit

Keywords: TieShan harbour,detrital mineral,depositional environment,heavy mineral source.

1. Introduction

Our samples are taken near the BeBu gulf of the south China sea,which is located in the east of Guangxi coast and connecting AnPu harbour in lianjiang county of Guangdong Province, and is one of important fishing ports and mercantile ports in Guangxi coast. The past studies on Guangxi coast are mainly focused on environmental protection and economic development of coastal zone. Overall investigation of the resources of Guangxi coast was made in the 1980s,but the study on clastic deposits and sediment transport was little.The study on sediment transport that include the direction and number of sediment transport in TieShan harbour have great significance to port construction, channel maintenance and environmental protection. In addition, The source and migration trend of sediment in the sea area can judgment by light and heavy mineral content and distribution, and further define the the hydrodynamic conditions will be better for taking corresponding measures to protect beach in coastal area. At the same time, TieShan harbour area have an abundance of sand resources, especially the content of zircon and ilmenite. Based on the latest survey data, the content and distribution characteristics of detrital mineral inTieShan harbour were given by study of 68 representative surface samples, and the specific and dominant minerals were pointed out, the distribution laws and reasons of affecting mineral were summarized and the high abnormal points of zircon and ilmenite were further pointed out for important practical meaning in evaluation and development of mineral resources in study area.

2. Study area

Oor research area is the only drowned type of harbour located in erosion accumulation of the sandy planation coast in BeBu gulf.the bay mouth is broading and about 32 km broad, The length is about 40 km from north to south and about 4 km broad from east to west, the bay coastline was about 170 km in long[1-4]. No major rivers flow to the sea in the region,and only a small Najiao river flow into Dandou sea. The area is irregular diurnal tide and the tide characteristics is reciprocating flow type. However, the area is maximum

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tidal range of Beibu Gulf and Guangxi coast. TieShan harbour is located in South Asia subtropical regions, the waves are south-southwest in summer and is northeast in winter[1-4],which plays important role in erosion and accumulation of beaches.

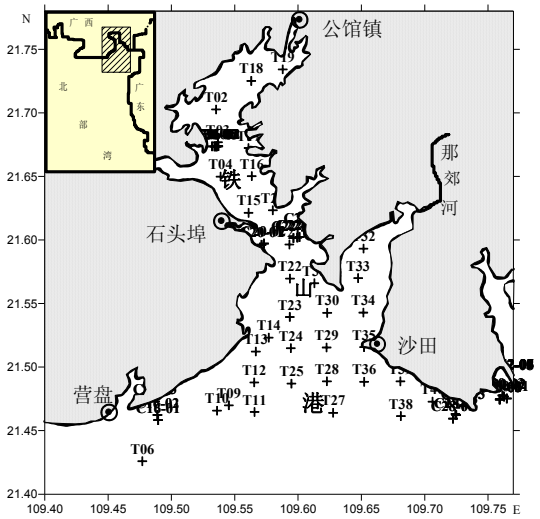

Fig. 1. Location map showing the sampling sites

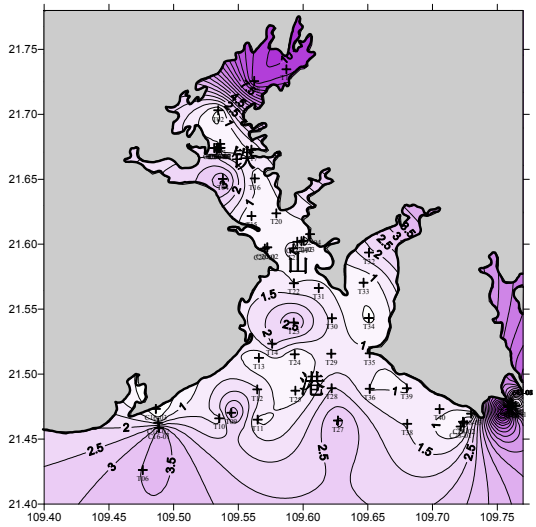

Fig 2：Iisoline chart of heavy mineral content

3. Sample source and analysis

The 68 surface detrital mineral samples were acquired by scientific exploration ship Prospector 407 carried out 908 special project in year 2004. The distribution area of the samples coverage basically all area of TieShan harbour in Guangxi,And these samples distributed almost in the coast and harbour(Fig.1).The analysis of detrital minerals appears below: Take deposits about 20~100 g to dry then dip them in clear water and add a little sodium hexametaphosphate solution to remove organic thing, separating deposits by brass sieve with 0.063,0.25 and 0.125 mm and weighing the sand of 0.063-0.125 mm, separating them with bromoform(density is 2.89g/cm3) and then weighted, to get content of light and heavy mineral and detrital mineral and the accuracy of weighing is 0.0001 g.There are about more than 400 mineral grains each sample, describing and identifying mineral features such as color, modality, streak, alteration degree, particle size and optical properties and so on. In addition,calculateing weight percent of detrital mineral and heavy mineral, the distribution characteristics of specific and dominant mineral were got, and dividing mineral combination.

4. Results

The average content of surface sediment clastic mineral is 12.56% in TieShan harbour and finer than clastic mineral of other Guangxi harbour. On the whole, these particle become gradually coarse from land to sea and the distribution of coarse and fine have changed little.The mineral variety are very rich and there are 48 kinds of heavy mineral, common heavy minerals are common amphibole, tremolite, epidote, zoisite, biotite, hydrobiotite, muscovite, tourmaline, garnet, titanite, apatite, diopside, hypersthene, ilmenite, limonite, anatase, hussakite, rutile, leucoxene, zircon, magnesite, autogeny pyrite and so on.The rich minerals are tourmaline, ilmenite,zircon, limonite and leucoxene and so on,and heavy mineral composation have a few debris and weathering mineral. there are 9 kinds of light mineral and rich with quartz and feldspar ontent is very little,and the plagioclase over potash feldspar and latter weathering deep. bioclast is less and other light mineral content are also little. The light mineral is major mineral and average content reaches as high as 97.43%. The average content of heavy mineral is only 2.58% and the highest content is 14.29%. The sedimentary mineral can he divided into land-derived material, authigenic minerals, and a few biological particles by study on sedimentary species mineral characteristics, The representative light mineral of study area is quartz, which identification features is granular, their colour include colorless ,white, pale reddish brown, pale green and earth yellow and so on, interior shows colorless or white, subangle subangular after crush them, mostly is single-crystal quartz, have weak polychromatic and a small quantity of inclusion.

Quartz is main mineral in light minerals, the average content of quartz is 88.46% and the highest content is 98.67%, both content of feldspar and mica are a few and more for weathering fragment.

The content of heavy mineral is not high in the study area(Fig 2), the average content is only 2.58% and the highest content is14.29% which located in the bay. Heavy mineral content have little change and about 2.00% fluctuation. The experimental data show that the places of high heavy mineral content of TieShan harbour where the content of clastic mineral relatively low, and the places of low heavy mineral content where the content of clastic mineral relatively high. This is due to big tidal range and the ebb current velocity is greater than the find current velocity lead to coarse particle rich in sublittoral zone. In addition, distribution of heavy mineral have some connection with clastic particle size,and relatively content of heavy mineral that relatively coarse clastic minerals is few in water power function.

Zircon(Fig 3) have considerable concentration trend in the region, Its identification features are most long granular, part of granular, intact crystal form, with four square column and the four winds double cone together shape common, colorless or small red, rosy red in a few which crystal is not complete and crystal edges were scuffed to ovoid, glass- emery sheen, refractive index is high, the parallel extinction and interference color level 4-senior white.The average content of zircon is 14.80% and the highest content is 48.05%.On the whole, zircon have high content and distribution is relatively uniform and only

Ilmenite(Fig 4) is the most common heavy mineral in Guangxi coast, its identification features are granular and clintheriform, black and strong metal luster, some surface have white and brown film, subangle subangular-subrnd subround and a few is round. The average content of ilmenite is 11.01% and the highest content is 31.97%.On the whole, the content distribution of west side just above the east bay. This is a spatial distribution law under monsoon of NE-SW and N-S direction and wave. The consistency turn up in ilmenite content and space distribution of heavy mineral and the average content of TieShan harbour change little, this is because ilmenite is large proportion heavy mineral and rich in where the strong water power.

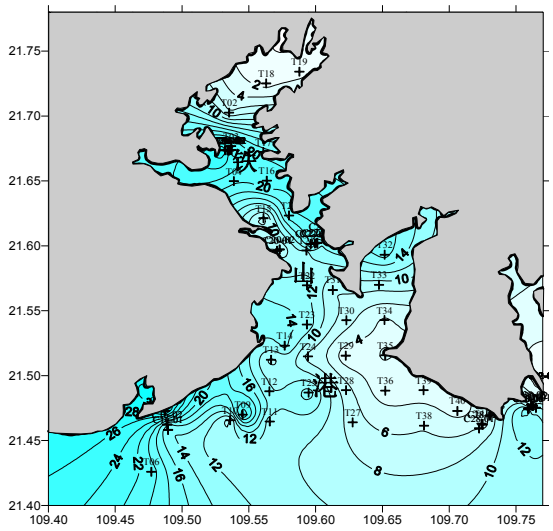

Fig 3：Isoline chart of zircon content

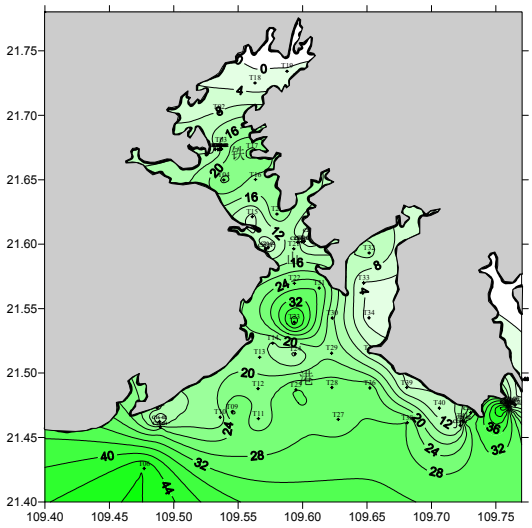

Fig 4：Isoline chart of ilmenite content

There are rich coastal sand resources in TieShan harbour. Various useful mineral in the area were tested out by this mineral analysis,and ilmenite, zircon and quartz can be used as the main minerals to be survey,and monazite, xenotime and tourmaline as beneficial minerals to make comprehensive survey. According to the mineral analysis results, zircon and ilmenite of heavy mineral were grade calculated.

The result of computation shows that TieShan harbour placers has a strong abnormal, especially zircon. There are 18 abnormal samples and close to 30% in surface kind of 68 test samples. The abnormal zircon grade primarily in grade Ⅱ(0.25-0.50 kg/m3), Ⅰ abnormal level (0.50-1.00 kg/m3) have10 samples. Sample that to boundary grade requirements (1.00-2.00 kg/m3) there are 4 samples, and there are 3 samples with industrial grade (>2.00 kg/m3)and there is a abnormal grade point.There are only two surface samples of

ilmenite show Ⅱ abnormal level, There are a certain amount of mineral resources distribute in 0.25-0.125mm by study on very fine sand[5,6] (Fig 5).

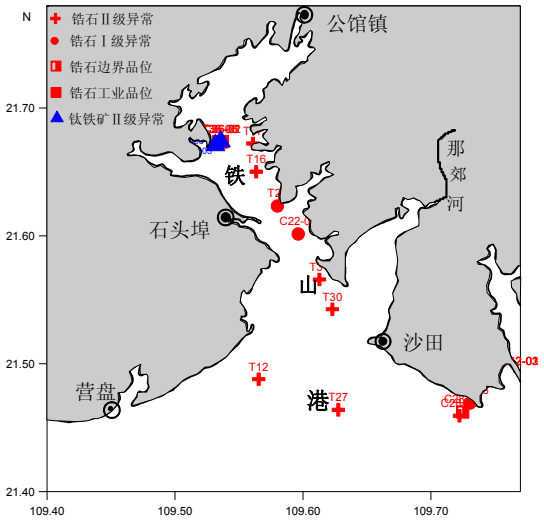

Fig 5: Abnormal site of Zircon/Ilmenint content

There are higher zircon abnormal distribution in the study area and show that the good signs of TieShan harbour as zircon resources area.The analysis results show that the area should be as key resources area for further exploration.

5. conclusion

Many sites in harbour appeared zircon grade abnormalities and zircon resources have good prospect.

The distribution of detrital mineral is affected significantly by standing wave in TieShan harbour and the tide velocity change result in detrital minerals from the north to the south and high and low showed regularity distribution. Coastal sediments mainly comes from the land in Guangxi, clastic mineral distribution is affected by landform and water power, the sediment in port mainly controlled by tide, waves the second and the trend about is NE-SW.

6. Acknowledgements

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