

21st February, 1945

Report on Examination of Concentrate
of Black Sand From Fraser River Beach, King Is.
(Sample 6 x 1)

As a result of a laboratory examination of the above sample collected by the Director of Mines in February, 1945, I report that the concentrate is made up of the following minerals:-

% (Dry weight).

Ilmenite	..	91.5
Magnetite	..	5
Garnet	..	2.5
Zircon	..	1
Apatite	..	Present as inclusions in Zircon

100%

Details of Tests:

The concentrate as received was separated by hand magnet into magnetite and residue. Both fractions were again cleaned with a magnet and the magnetite fraction was examined under microscope for presence of other minerals. Both fractions were weighed and the percentage of Ilmenite calculated. Samples of the residue were then examined under the microscope in Monochlornaphthalene (R.I. 1.64) and the grains were counted as they were determined. Of 2316 grains examined 2218 were opaque (later determined as ilmenite) 69 were a pale pink garnet and 26 were provisionally determined as zircon and 3 were doubtful but probably zircon. The mineral determined as zircon has a high refractive index (about 1.75-1.9) and strong birefringence. Extinction is straight. The crystals were too small to give an interference figure. It occurs in prismatic crystals of tetragonal appearance about twice as long as wide. Crystal faces are simple prisms and pyramids. In nearly every case inclusions of apatite and magnetite are present. The presence of the magnetite inclusions may account for this mineral having been picked up by the magnetic separator.

There is little doubt that this mineral is zircon. The only other mineral which could fit its observed characters is monazite, but the habit, and the always straight extinction (Monazite has extinction angles up to 40°) discount this interpretation. If it is desirable to be absolutely certain on this point, an analysis of some of the concentrate should be made. If the mineral is correctly determined as zircon, the analysis should show about 0.6% ZrO_2 and P_2O_5 less than .002. If on the other hand the mineral is monazite the analysis should show P_2O_5 about 0.3% and oxides of cerium metals about 0.6%.

In order to determine the opaque mineral which makes up 91.5% of the concentrate, a sample of the residue after the removal of magnetite was boiled for 15 minutes in concentrated HCl. A deep yellow solution of $TiCl_4$ resulted. A

piece of metallic tin was added and the mixture boiled for another 15 minutes. The solution turned deep purple (TiCl_3) confirming the provisional identification of ilmenite.

There is a possibility that chromite in small quantities may be present in the fraction determined as ilmenite from which it would not have been distinguished in the foregoing examination. If it is necessary to be certain on this point, a chemical analysis for Cr_2O_3 will need to be made.

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GOVERNMENT GEOLOGIST

The Director of Mines.