

DETERMINATION OF QUANTITY OF HEAVY MINERALS IN SANDS FROM CASWELL COUNTY

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by
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Introduction

Mr. Bill Wilson; geologist with the Division of Mineral Resources, sent to the Minerals Research Laboratory two samples of sands from Caswell County. He requested that we determine the percent magnetite and other heavies in the two samples.

Samples

Lab. No. 3498 as received weighed approximately three pounds and consisted predominantly of quartz, with minor amounts of hematite, magnetite, hornblende, kyanite and feldspar. Prior to scrubbing, ultra fine particles adhered to the coarser particles of the sample. Microscopic examination showed that many particles consisted of quartz intergrown with magnetite and other heavy minerals.

Lab. No. 3499 as received also weighed approximately three pounds and was coarser than Lab. No. 3498. It consisted mainly of quartz, with minor portions of magnetite, hematite, kyanite and feldspar. As in the above sample, ultra fine particles coated the coarser particles prior to scrubbing. Many particles were intergrowths of two or more minerals. Screen analyses of the above two samples are shown in Table 1. These screen analyses were carried out on the head samples prior to scrubbing.

Table 1

Screen Analysis of Head Sample as Received

| <u>Sample No. 3498</u> | | | <u>Sample No. 3499</u> | | |
|------------------------|-------------|------------------|------------------------|-------------|------------------|
| <u>Screen</u> | <u>% Wt</u> | <u>Cum. % Wt</u> | <u>Screen</u> | <u>% Wt</u> | <u>Cum. % Wt</u> |
| +20 | 14.0 | 14.0 | +20 | 20.8 | 20.8 |
| +35 | 12.8 | 26.8 | +35 | 23.4 | 44.2 |
| +65 | 18.9 | 45.7 | +65 | 22.4 | 66.2 |
| +100 | 14.9 | 60.6 | +100 | 10.1 | 76.7 |
| +150 | 13.9 | 74.5 | +150 | 7.9 | 84.6 |
| +200 | 15.8 | 90.3 | +200 | 8.5 | 93.1 |
| -200 | <u>9.7</u> | 100.0 | -200 | <u>6.9</u> | 100.0 |
| Total | 100.0 | | Total | 100.0 | |

Procedure

In order to determine the percent magnetite and other heavies in the two sand samples, the following procedure was used:

- 1) Each of the samples was weighed as received.
- 2) Each of the samples was dried at a low temperature.
- 3) Each sample was thoroughly mixed and approximately 100 grams was cut out and saved as a head sample.
- 4) Approximately 200 grams was cut out from each sample for evaluation purposes.
- 5) These 200-gram samples were subjected to a 5-minute scrub at 1000 rpm at 70 percent solids to remove adhering fines.
- 6) They were deslimed at about 200 mesh. Minus 200 mesh slimes were dried and saved.
- 7) The plus 200 mesh material was screened at 35 mesh and the two products were dried.

- 8) Both screen products were subjected to heavy liquid separation using tetrabromoethane (specific gravity 2.96).
- 9) The sinks and floats from the heavy liquid separation were dried and weighed.
- 10) The sink products, from the above separation, were submitted to the Division of Mineral Resources for mineralogical analyses.

Results

The data obtained from heavy liquid separations and the mineralogical analyses of the sink products, as shown in Tables 3 and 4, are condensed in Table 2.

Table 2

| <u>Mineral</u> | <u>Sample No. 3498</u> | <u>Mineral</u> | <u>Sample No. 3499</u> |
|------------------------|--|------------------------|--|
| | <u>Content of +200 Mesh Mineral in Head Sample</u> | | <u>Content of +200 Mesh Mineral in Head Sample</u> |
| Magnetite | 4.22 % Wt | Magnetite | 12.65 % Wt |
| Hematite | 1.09 " | Hematite | 1.22 " |
| Hornblende | 5.63 " | Hornblende | 15.14 " |
| Kyanite | 0.49 " | Kyanite | 3.11 " |
| Feldspar | 1.11 " | Feldspar | 3.11 " |
| Colorless | 0.16 " | Quartz | 2.05 " |
| Total Sink(Sp.G. 2.96) | <u>12.70 "</u> | Total Sink(Sp.G. 2.96) | <u>37.28 "</u> |

As shown in Tables 2 and 3, sample 3498 contains 12.7 percent of plus 200 mesh total sinks and 4.22 percent of plus 200 mesh magnetite. In Tables 2 and 4 it can be seen that sample 3499 contains 37.3 percent of plus 200 mesh total sinks and 12.65 percent of plus 200 mesh magnetite. No separation or identification of minerals finer than 200 mesh was made in this investigation.

Mineralogy

Mineralogical analyses on the heavy liquid sink products of both the plus 35 mesh and minus 35 mesh plus 200 mesh fractions of samples 3498 and 3499 are shown in Tables 3 and 4. These mineralogical analyses were carried out by Mr. Jerry Bundy and Mr. Don Moore of the Division of Mineral Resources.

Table 3

Sample No. 3498

Results of Heavy Liquid Separation

| <u>Product</u> | <u>% Wt</u> | <u>Product</u> | <u>% of Screen Fraction</u> | <u>% of Head Sample</u> |
|----------------|-------------|----------------|-----------------------------|-------------------------|
| +35 Mesh | 26.7 | Float 2.96 | 93.3 | 24.9 |
| | | Sink 2.96 | <u>6.7</u> | <u>1.8</u> |
| | | Total | 100.0 | 26.7 |
| -35 Mesh | 55.1 | Float 2.96 | 80.2 | 44.2 |
| | | Sink 2.96 | <u>19.8</u> | <u>10.9</u> |
| | | Total | 100.0 | 55.1 |
| -200 Mesh | <u>18.2</u> | | | <u>18.2</u> |
| Total | 100.0 | | | 100.0 |

Mineralogy

| <u>Product</u> | <u>% of Total Sample</u> | <u>Mineral</u> | <u>% Wt</u> | <u>% of Head Sample</u> |
|----------------|--------------------------|----------------|-------------|-------------------------|
| +35 Mesh Sink | 1.8 | Hematite | 60.5 | 1.09 |
| | | Magnetite | 10.3 | 0.18 |
| | | Hornblende | 20.2 | 0.36 |
| | | Colorless | <u>8.9</u> | <u>0.16</u> |
| | | Total | 99.9 | 1.79 |
| -35 Mesh Sink | 10.9 | Magnetite | 37.1 | 4.04 |
| | | Hornblende | 48.4 | 5.27 |
| | | Kyanite | 4.5 | 0.49 |
| | | Feldspar | <u>10.2</u> | <u>1.11</u> |
| | | Total | 100.2 | 10.91 |

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Table 4

Sample No. 3499

Results of Heavy Liquid Separation

| <u>Product</u> | <u>% Wt</u> | <u>Product</u> | <u>% of Screen Fraction</u> | <u>% of Total Sample</u> |
|----------------|-------------|----------------|-----------------------------|--------------------------|
| +35 Mesh | 24.9 | Float 2.96 | 49.2 | 12.3 |
| | | Sink 2.96 | 50.8 | 12.6 |
| | | Total | 100.0 | 24.9 |
| -35 Mesh | 40.9 | Float 2.96 | 39.6 | 16.2 |
| | | Sink 2.96 | 60.4 | 24.7 |
| | | Total | 100.0 | 40.9 |
| -200 Mesh | 34.2 | | | |
| Total | 100.0 | | | 34.2 100.0 |

Mineralogy

| <u>Product</u> | <u>% of Total Sample</u> | <u>Mineral</u> | <u>% Wt</u> | <u>% of Total Sample</u> |
|----------------|--------------------------|----------------|-------------|--------------------------|
| +35 Mesh Sink | 12.6 | Hematite | 9.7 | 1.22 |
| | | Magnetite | 27.1 | 3.41 |
| | | Hornblende | 46.7 | 5.88 |
| | | Quartz | 16.3 | 2.05 |
| | | Total | | 12.56 |
| -35 Mesh Sink | 24.7 | Magnetite | 37.4 | 9.24 |
| | | Hornblende | 37.5 | 9.26 |
| | | Kyanite | 12.6 | 3.11 |
| | | Feldspar | 12.6 | 3.11 |
| | | Total | 100.1 | 24.72 |

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