Report on the

Production of expandable graphite

for

Green Battery Minerals Inc.

by

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Initial sample analysis

ProGraphite received 125g of flake graphite on July 1st, 2024. The sample received the internal number L#955.

ProGraphite conducted a test to convert the graphite into expandable graphite.

The sample material was screened to check the particle size distribution (PSD) which is shown in the table below.

mesh	**+50**	**+80**	**+100**	**+150**	**-150**
µm	**+315**	**+180**	**+150**	**+100**	**-100**
%	2.07	94.31	2.14	1.14	0.33

Table 1: PSD original sample

The PSD is typical for good +80 mesh material.

An analysis was conducted to determine the moisture content, the content of volatiles and the carbon content (Loss of ignition (LOI) method) of the graphite concentrate. The results are provided in Table 2.

Fraction	Moisture (105°C)	Volatiles (400°C)	Loss of ignition
Concentrate	0.1%	0.2%	98.2%

Table 2: Moisture content, content of volatiles and LOI for L#955

The moisture content and content of volatiles are both very low. The LOI value is high. All values are favorable.

The oxidation behavior of graphite is analyzed using Thermogravimetric Analysis (TGA). The measurements were taken in-house using the LECO TGA 701. The results are shown in Table 3 below.

	Weight loss during 120 minutes at 650°C	Weight loss after 4 h @ 650°C	Time for incineration from 30% LOI to 80% LOI at 950°C	
	%	%	min	%/min
L#955	3.24	7.4	93.73	0.53

Table 3: TGA results for sample L#955

The TGA analysis graph is shown in Figure 1.

The temperature ramp used was as follows:

105°C 1 h
400°C 1 h
650°C 4 h
950°C 4 h

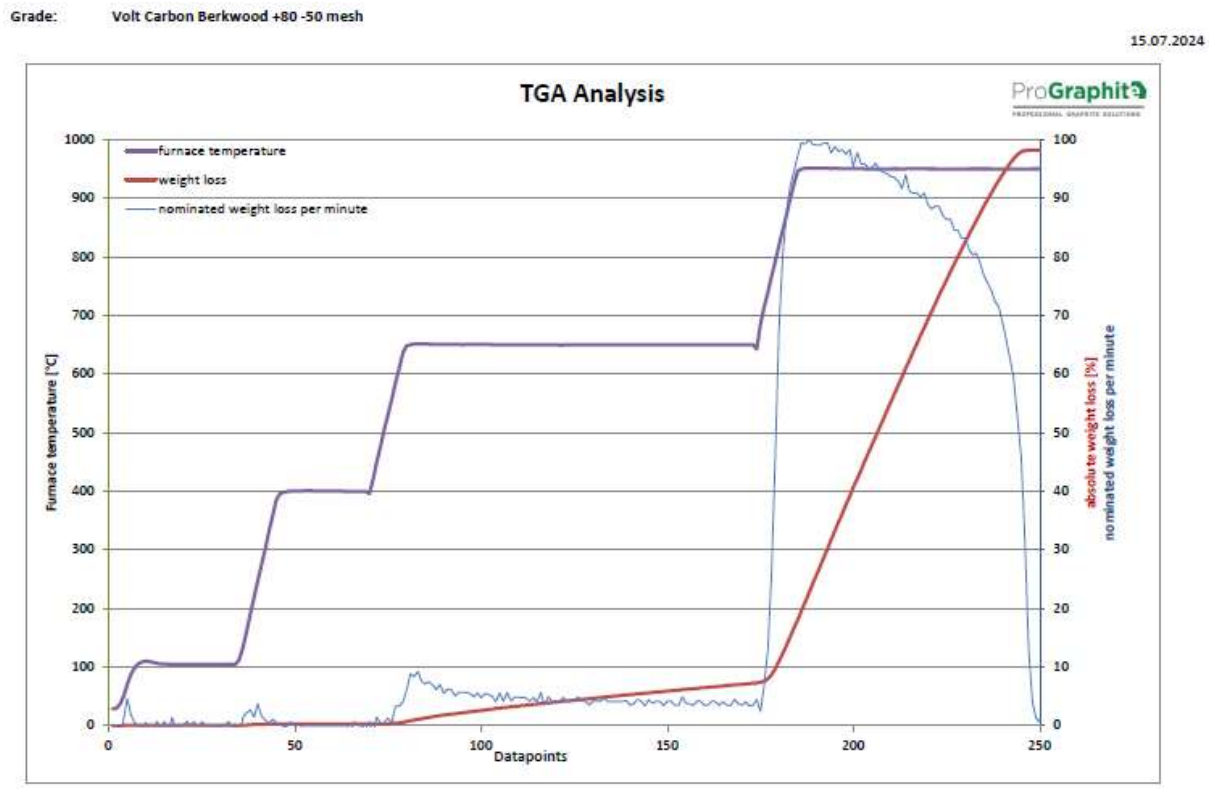


Figure 1: TGA analysis for sample L#955

The oxidation data of the graphite are good, only slow oxidation is observed @650°C.

Production of expandable graphite

A conventional production of expandable graphite was carried out, i.e. concentrated sulphuric acid was used as intercalation acid and potassium permanganate was used as oxidising agent.

The processing went smoothly and the material could be used effortlessly. After completion of the intercalation, the material was washed and neutralized with water before drying.

Various tests were carried out with the dried expandable graphite: first, the expansion rate was tested, i.e. the volume of expanded graphite that can be achieved from one gram of expandable. To do this, a sample was shock-expanded at 1000°C and the volume was then determined. The expanded graphite obtained is shown in the picture below.



Figure 2: Expanded graphite: left: overview, right: close up

Test results

The following results were obtained from the tests:

The expansion rate of the expandable graphite is 325 ml/ g. This is an excellent result for +80 mesh material. The material seems to be very suitable for the production of expandable graphite.

Another parameter analysed was the carbon content (LOI method) after the expansion process: This is approx. 98.5%, i.e. a slightly increased level as the carbon content of initial material used as precursor material for the expandable graphite production.

Furthermore, the onset temperature (temperature when the material starts to expand) was determined at around 200°C, which is a typical value for expanded graphite that has been produced with the sulfuric acid/potassium permanganate method.

In summary, it can be said that the material provided be easily and without problems converted into expanded graphite. The expansion rate achieved (as the most important quality parameter) is at a high level, the graphite seems to be very suitable to be used as precursor material for the production of expandable graphite.

Untergriesbach, 24.07.2024
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