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OUR REFERENCE 23728

REPORT ON SEPARATION OF GLAUCONITE FROM GLAUCONITE QUARTZ SANDSTONE.

GNT 014

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INTRODUCTION

A glauconite rich sandstone was submitted for processing of the glauconite content for chemical analysis.

Approximately half of the rock specimen was loosely crushed, and a representative fraction of this taken for XRD analysis. A separate slice of the original rock was made into a thin section.

The remainder of the half sample which weighed approximately 517 g was initially screened at 500 µ, 212 µ and 107 µ, without using a mortar and pestle.

The -500 µ and -212 µ. samples were magnetically tested using a dual disc Rapid. Magnetic separator. The magnetic settings were Mag1. (Equivalent to ilmenite), Mag 2. (Equivalent to ferromagnesian silicates) and Non Mags. Ferromagnetics such as magnetite would also be recovered .

These initial results showed significant quartz glauconite composite's for the -500 µ fraction and a good separation from quartz for the -212 µ fraction.

The generally rounded habit of the glauconite and the quartz meant that the composites were of a marginal nature, i.e. the actual contact area was of a relatively small area.

Subsequently the -500 µ +212 µ fraction was screened through 400, 300, 212 and 106 µ apertures. The resulting +400, +300, +212 and +106 µ fractions were magnetically separated and some non mag fractions further separated in TBE liquid..

SUMMARY OF RESULTS.

Magnetic processing of the lightly crushed glauconite rock sample roughly doubled the grade at +106+ -300 micron sizes. There is also 5-10% phosphorite present , part of which is incorporated in the glauconite grains.

RESULTS

1. XRD

The XRD spectra for glauconite is poor, and therefore Rietveld analysis is not possible .

GLAUCONITE	**MINOR**
QUARTZ	**MAJOR**
APATITE	**MINOR**
POTASH FELDSPAR	**MINOR**

2. MINERAL SEPARATION

Approximately half the rock specimen (~ 500 g) ~was loosely crushed and initially screened at 500 µ, 212 µ and 106 µ without using a mortar and pestle because of its friable major .

Initial tests using the -500 µ and -212 µ.samples of a magnetic separation using a dual disc rapid machine gave a significant glauconite magnetic concentration with quartz etc as non-mags.

There was evidence of much composite material between quartz and glauconite in the +212 µ material. However the composites were of a simple nature with a small contact area. The -500 µ +212 µ sand was screened into +400, +300 and +212 µ fractions.

Wt%/WT.	**M1**	**M2**	**NON MAGS**
+500		1.2/6.4,	
+400	<0.1/0.15	5.6/28.9	6/31.2
+300	1.4/7.3	9/46.2	6/30.8
+212	3.2/16.6	33.4/172	20/103
+106		3.8/19.8	7.4/38
-106		2.8/14.5	
	4.7	55.8	39.4

Attempts to reduce the composite nature by attritioning and ultrasonics was not successful. The +106 and + 212 fractions only gave good concentrates and were submitted for assay.

3. CHEMICAL ANALYSES

Wt%	M2 -300 +212	M2 +106-212	FEED.
Na2O	0.04	0.08	0.06
MgO	3.48	3.52	1.93
Al2O3	7.05	8.5	4.68
SiO2	50.54	47.92	67.95
CaO	4.14	4.53	4.13
K2O	7.15	7.19	4.38
P2O5	2,79	3.05	2.89
MnO	0.02	0.06	0.03
Fe2O3	19.5	18.78	10.7
TiO2	0.07	0.61	0.24
LOI	4.83	5.1	2.84
Glauconite	~80%	~80%	44%
K feldspar			5%
Quartz			40%
Apatite	7%	7.5%	7%

These calculations are based on the SEM/EDS analyses of glauconites as below, and estimation of K feldspar by staining in the feed rock. Glauconite is not a stoichiometric mineral however the glauconite content of the two products is calculated using the iron content and assuming the feldspar content is negligible. The apatite content of these two products is likely to be largely entrained phosphate in the glauconite ,as illustrated below.

4. SEM ANALYSIS

The XRD analysis showed a minor content of apatite. This was not reflected by the quantity visible as discrete grains in the thin section. Consequently the polished thin section was examined by SEM/EDS.

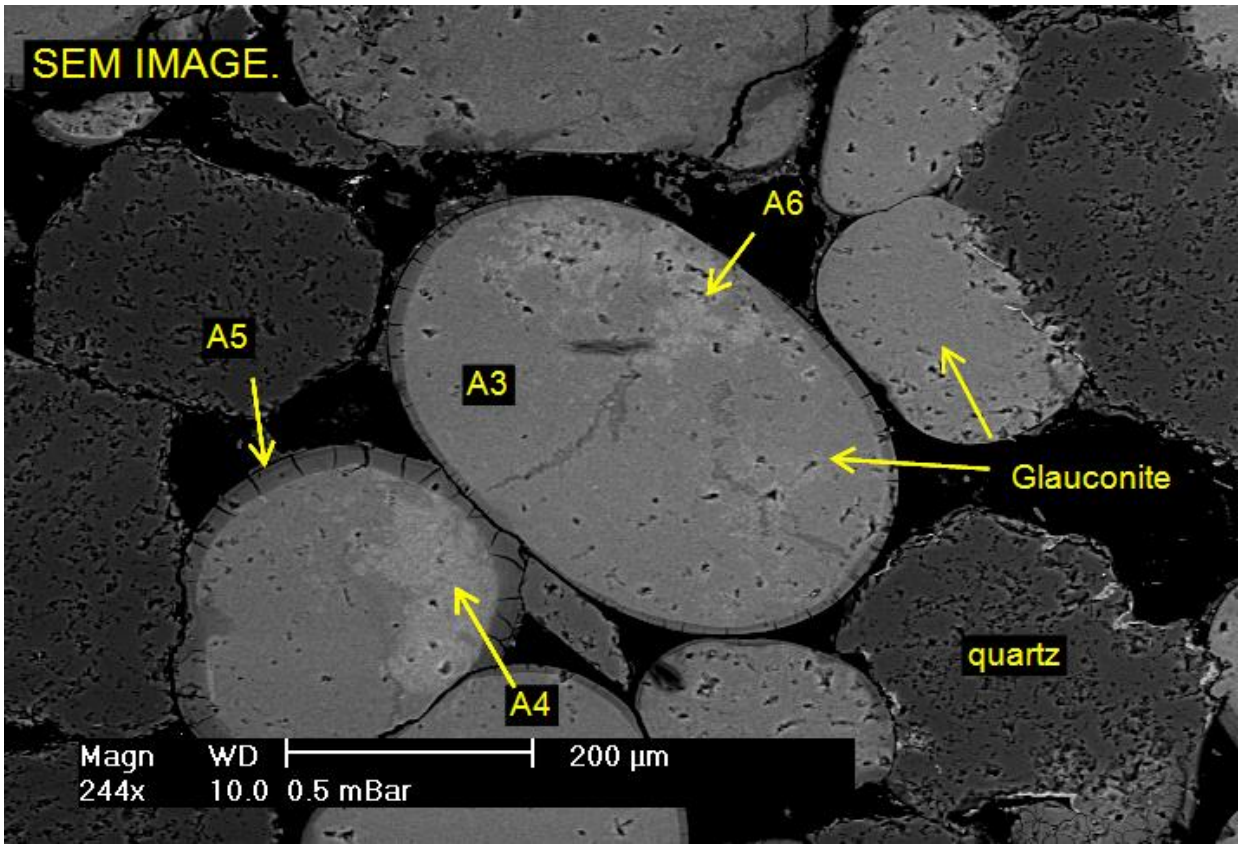
This found a not insignificant number of glauconite grains were impure due to the presence of areas of calcium phosphate. The phosphate areas are clearly indicated by a brighter back scatter electron patches Several examples of these composite grains were analysed as points within the glauconite rich and glauconite poor regions.

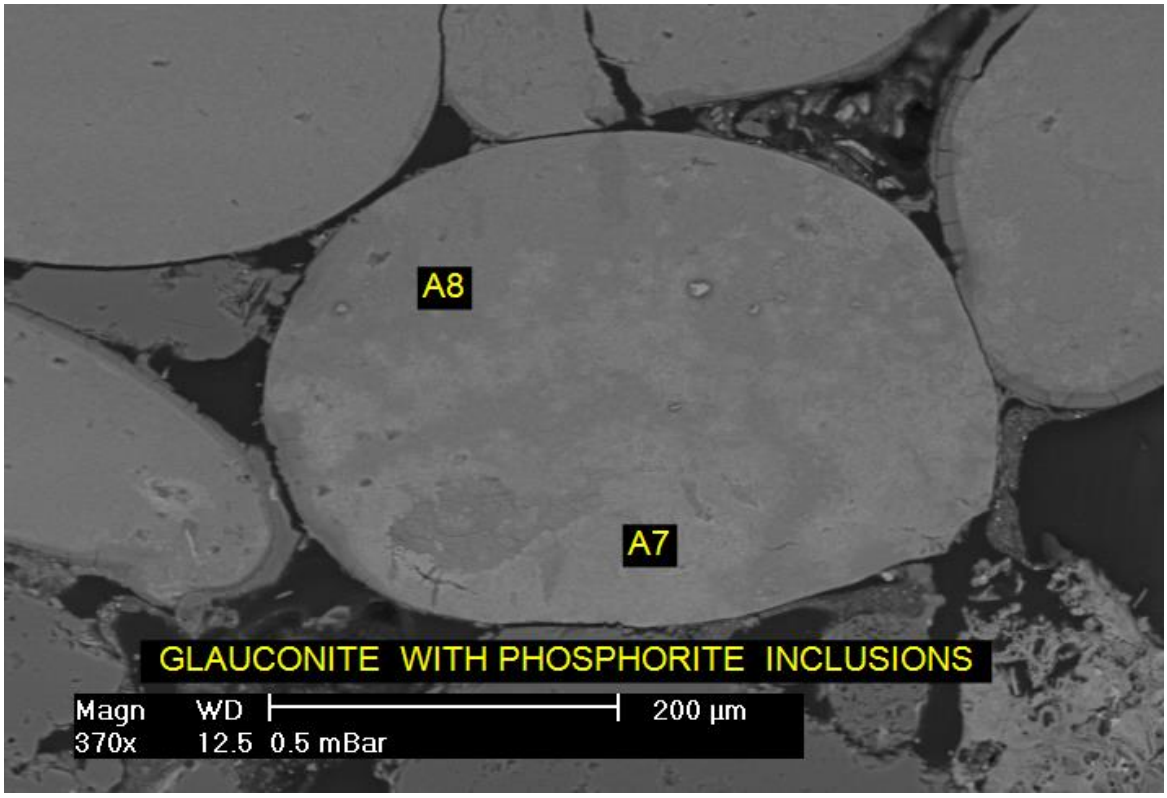
SEM/EDS ANALYSES

Wt%	1	2	A3	A4	A5	A6	A7	A8
MgO	5	4.5	4.5	1	4	1	1.7	5.0
Al2O3	9.7	8.1	8.2	4	13.7	1	3.3	9
SiO2	62.5	59.8	59.5	20.5	67	13.5	15.5	61
K2O	7.9	8.8	8.7	2.5	4	2.0	1.8	8
FeO	14.7	18.8	19.0	3.6	7	3	2,9	16
P2O5				33.1		34	35.5	0.7
CaO				34.9		43	39.7	0.6

Note These values should be adjusted down by 9% for the water content.

Analyses 1 and 2 are of glauconites with low phosphate content.





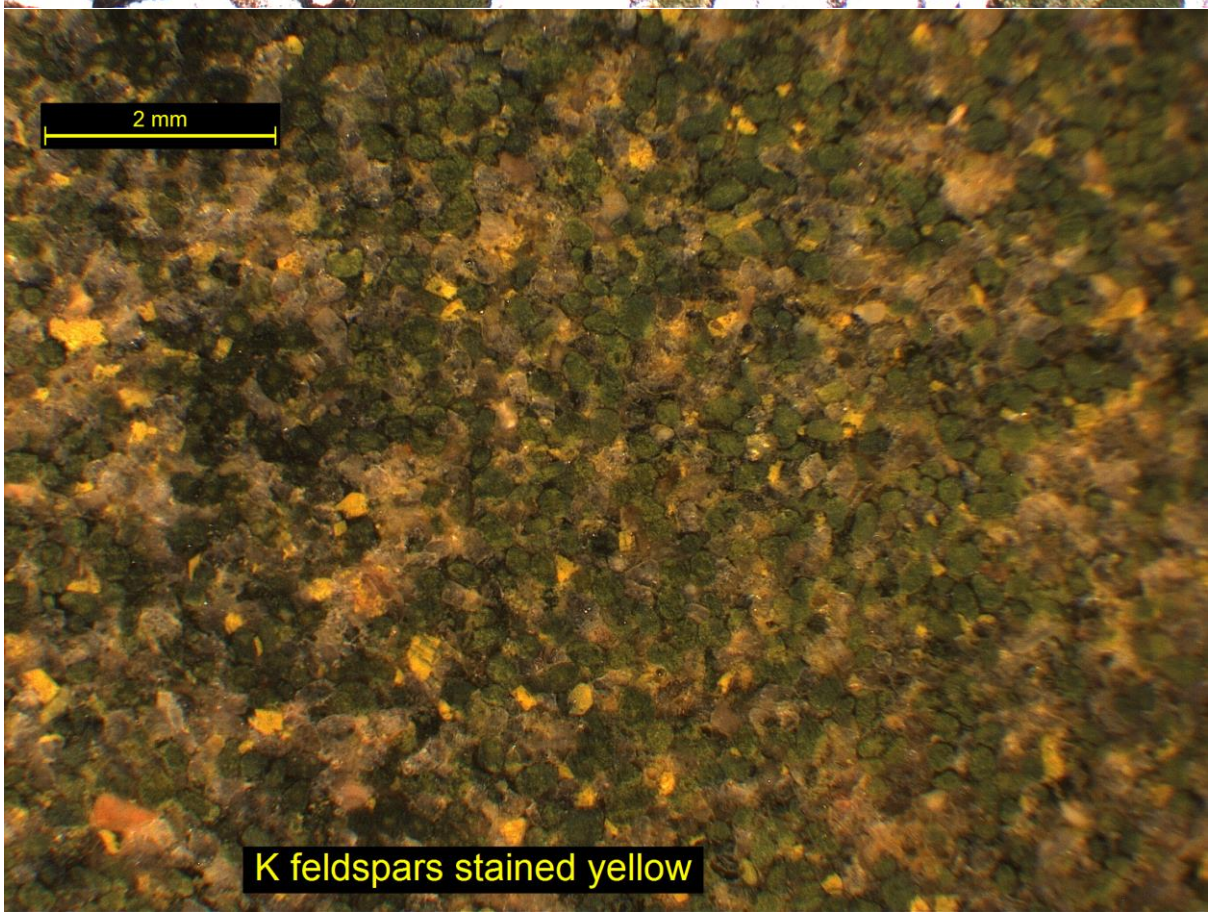
5. NON-MAGNETICS

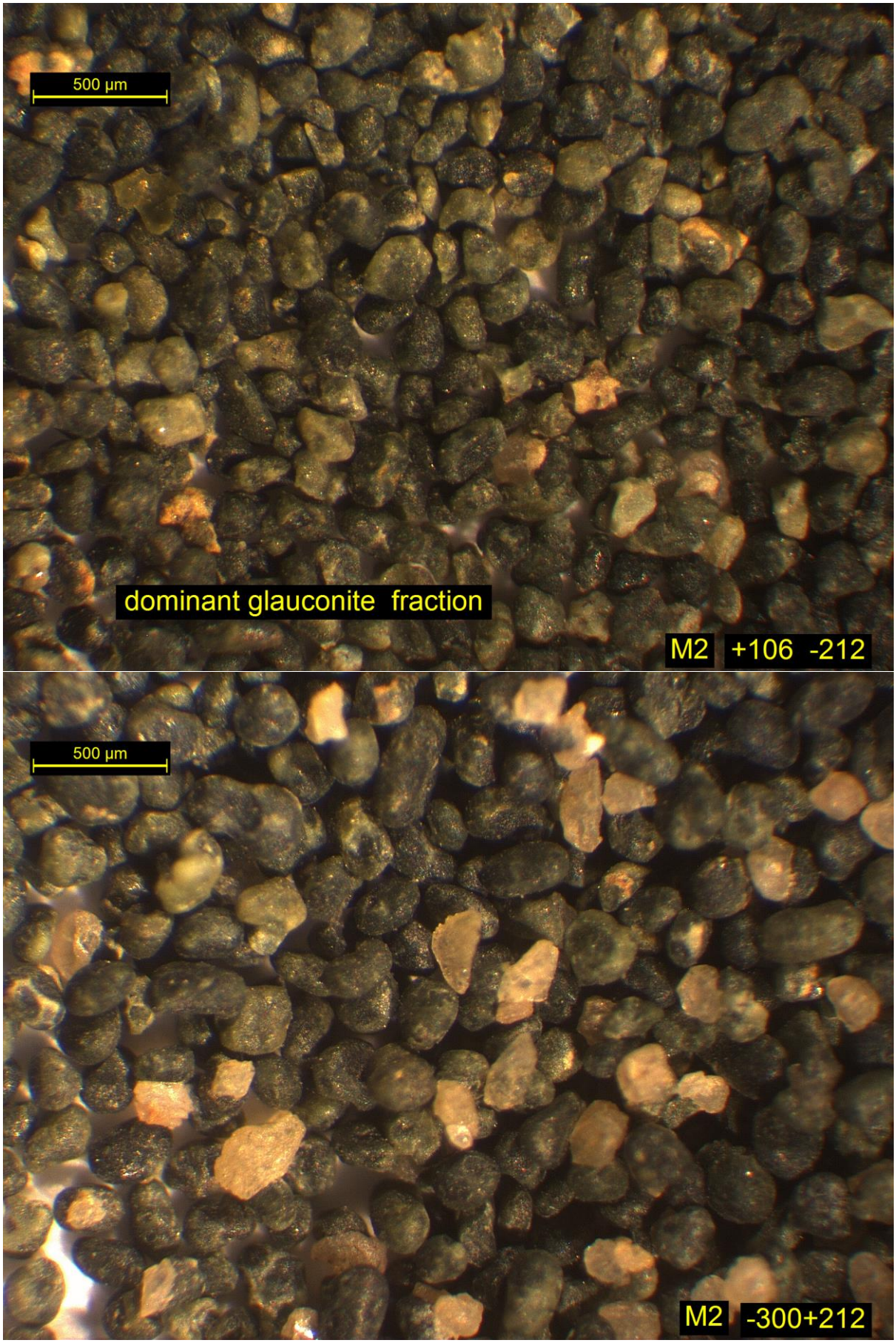
The presence of significant calcium phosphate/phosphorite/collophane from the XRD suggested the quantity should be readily measurable in the non-magnetic fraction with low SG quartz , the only other significant constituent. The table below shows the percent of the non-mags TBE sinks fraction .

WT%	TBE Sinks
+400 µ	0.7%
+300 µ	1.1%
+212 µ	5.8%
+106 µ	7.3%

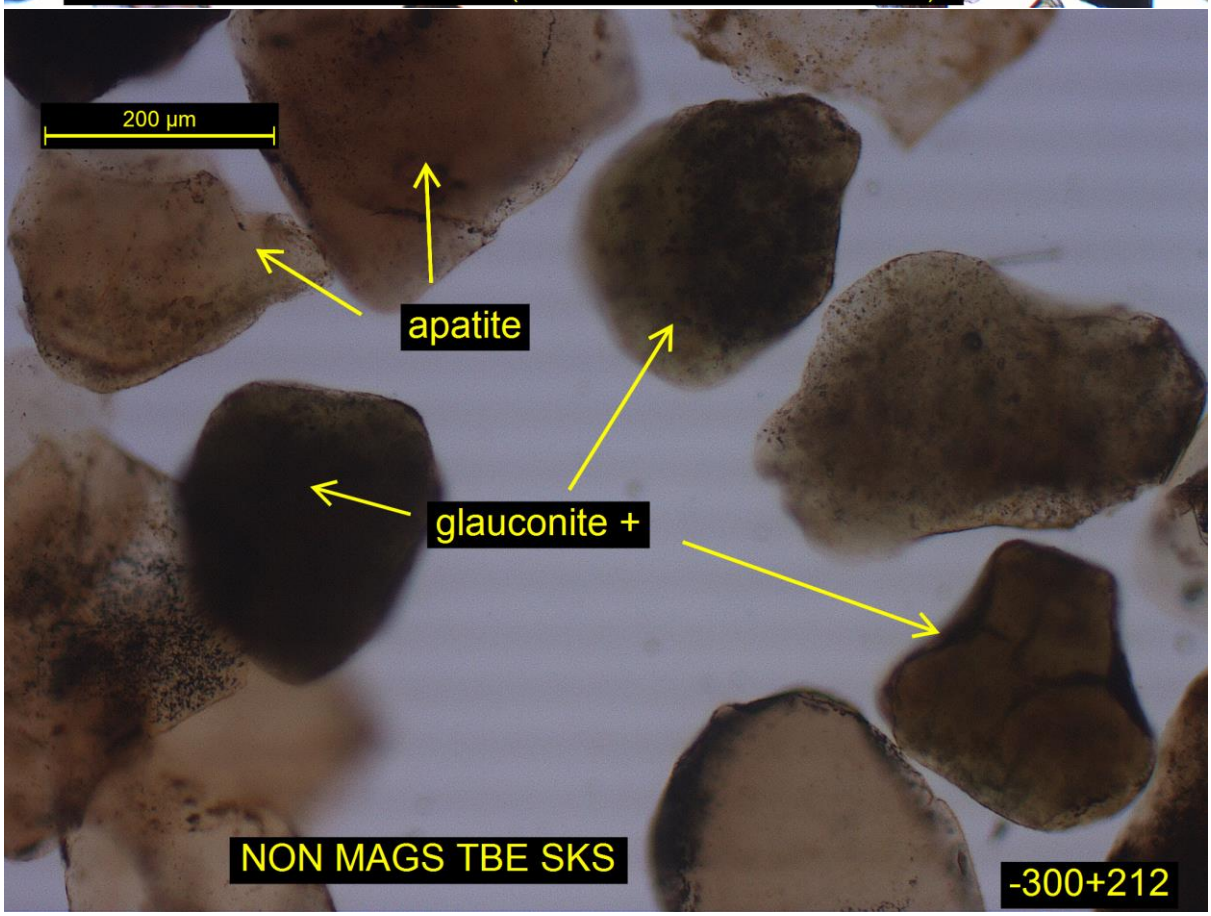
Polarised light examination of the two significant weight samples found that the +106 fraction was dominantly phosphorite, whereas the other fraction contained some composite glauconite/phosphorite grains as well as *phosphorite sensu stricto.*


500 µm
GLAUCONITE SANDSTONE


2 mm
K feldspars stained yellow


500 µm
dominant glauconite fraction
M2 +106 -212
500 µm
M2 -300+212


500 µm
PHOSPHORITE CONCENTRATE(NON MAGS TBE SKS -212+106)-


200 µm
apatite
glauconite +
NON MAGS TBE SKS
-300+212