IMC

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Date: 14/01/2011
Project No: 5001_0174

Dear Mr Barnett

RESULTS OF THE MINERALOGICAL EVALUATION OF TWO SAMPLES OF SMECTITIC CLAY: Your sample numbers: “Kloof Upper” (IMC934) and “Kloof Lower” (IMC935) refers:

Please find included the results of the work relating to your instruction to conduct mineralogical analyses of the above-mentioned two montmorillonite-bearing clay samples.

It is noted that all work was done on an as-received basis. As both samples were received in a crude form, the samples were dried (40ºC), crushed, split and pulverized.

IMC934 consists of mottled, greyish white and light brownish plastic, very fine-grained clay. The sample resembles material that has been disturbed and/or mixed.

IMC935 has a typical bentonite texture. It is light to medium brown in colour, very fine-grained low quartz content clay and is highly plastic.

From the analytical results below it is evident that the mineralogy of IMC934 and IMC935 are quite different.

The composition of IMC934 differs from IMC935 in the presence of minerals such as alunite and amphibole, and most notably, high concentrations (30 weight %) kaolinite.

This upper clay layer resembles that of a clay layer at the floor of a lagoon which originally contained noticeable quantities of salts derived from mixtures of evaporating brakish (sea) and fresh water in the young cretaceous sediments on the coast.

When these evaporating waters came into contact with the more organic rich acidic fresh water from the highland areas inland, S from the local oxidation of pyrite (or bacterial action) together

with higher concentrations of alkali metal ions (Na and K), Al and even Fe, could have been introduced into the lagoon.

This would have resulted in the precipitation of minerals from the alunite-jarosite minerals series, forming thin crusts/layers and lenses in the top 0,5 -1 m of sediment saturated with light-brine water of the water-sediment-floor interface where, during dry times the evaporating brakish waters would fix and contain higher concentration of salts.

Such an environment would be found in playa-type environments.

A similar model would possibly also explain the presence of localized, subordinate quantities of jarosite and alunite in the secondary clay deposits in the Grahamstown area.

The origin of amphibole indicated in the mineral analyses of IMC934 is not clear. It could have been derived from intrusive, intermediate-composition rocks occurring in the eroding source area of the clay? The concentrations of amphibole are very low as would be expected from an unstable mafic mineral in this environment.

IMC935 consist only of smectite and interstratified-smectite clay with a relative small amount of quartz. In the hand specimen the clay is plastic and smooth due to a low quartz content (10% according to the X-ray diffraction analyses below). The general macroscopic features of the clay as well as the mineralogical compositions resembles that of the typical young (cretaceous-aged) bentonite of the Southern Cape coast, that has formed under slightly diluted or undiluted marine-water conditions.

It is the author's opinion that clays similar to IMC935 could very well be amenable to beneficiation for higher-value applications such as in cosmetics, depending on the physical properties of the clay and especially the chemistry of the clay.

Sample	Client Sample No	Quartz	Mica	Kaolinite	Amphibole	Alunite [$KAl_3(SO_4)_2(OH)_6$]	Smectite (Montmorrilonite)	Illite / Smectite Interstratification
IMC934	Kloof Upper.	18	2	30	2	3	18	27
IMC935	Kloof Lower	10	-	-	-	-	67	23

The cost for this work amounts to R2424.20. IMC's banking details are as follows and the invoice is included on the following page.

Bank	ABSA
Branch name	ABSA Kolonnade
Branch Code	632005
Account type	Savings account (BizTransact)
Account name	GFJ Horn T/a IMC
Account No.	9250595333
Please quote "5001_0010" in the appropriate box on the deposit slip	

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Thank you for using IMC for this work and I trust that you will find everything in order.
You are welcome to contact me if I can be of any further assistance to you.

Kind regards

Johan Horn

IMC Industrial Minerals Consult SA (cc)

INDUSTRIAL MINERALS CONSULT (CC)

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INVOICE (Client copy)

Invoice No	F5001_0174		Client Order Nr	none provided (COD)
Invoice Date	14/03/2014		Order Date	none provided (COD)
Quotation No	QR5001-0174		Contact Pers.	R Barnett
PROJECT Nr	5001-00174			

** Item No:	Description	Quantity	Unit Price		Amount	
GEOEVAL	Mineralogical studies on 2 crude bentonite samples.	1	R 2,424.20			R 2,424.20
	GFJ Horn		SUB-TOTAL			R 2,424.20
		MINUS	DEPOSIT Thank you		R 0.00	R 0.00

Comments / Special Instructions					
		VAT @ 14%	0.14	No Vat Charged	
PLEASE USE THE FOLLOW REFERENCE No ON ALL COMMUNICATION AND WITH PAYMENT	5001-00174	TOTAL			R 2,424.20

BANKING DETAILS ARE AS FOLLOWS: Name: IMC Industrial Minerals Consult SA (CC); Bank: ABSA; Branch Code: 632005; Account no: (savings account): 092-5315-8198