

ANALYSIS REPORT

July 15th 2022

Your reference: "11207091.8 | Blija", "11207091.8 | Klutenplas", "11207091.8 | Kwelder Dept",
"11207091.8 | Valgenweg", "11207091.8 | Lauermeerdijk", "11207091.8 | Nieuwe
Statenzijk"

Our reference: 2205AC

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Date report 15/07/2022

Report prepared by:

Dr. Rieko Adriaens



Your reference: "11207091.8 | Blija", "11207091.8 | Klutenplas", "11207091.8 | Kwelder Dept", "11207091.8 | Valgenweg", "11207091.8 | Lauermeerdijk", "11207091.8 | Nieuwe Statenzijl"
 Our reference: 2205AC

Table 1: Sample list with requested analyses.

Our reference	Your reference	Bulk XRD analysis	Clay analysis	Chemistry of exchangeable cations	BET-N ₂
2205AC01	11207091.8 Blija	x	x	x	x
2205AC02	11207091.8 Klutenplas	x	x	x	x
2205AC03	11207091.8 Kwelder Dept	x	x	x	x
2205AC04	11207091.8 Valgenweg	x	x	x	x
2205AC05	11207091.8 Lauermeerdijk	x	x	x	x
2205AC06	11207091.8 Nieuwe Statenzijl	x	x	x	x

Table 2: Measurement characteristics of the bulk XRD analysis.

Parameter	Value
Analysis	Bulk XRD analysis
Sample preparation	Automated wet milling in alcohol and specific pretreatment to avoid preferred orientation
Diffractometer	Bruker D8 Advance, XE-T detector, Cu-K α radiation
Data treatment methodology	In-house
Interpretation by	Dr. Rieko Adriaens
Date of measurement	13/06/2022
Date of data treatment	30/06/2022
Results	Table 7 and Figure 1

Table 3: Measurement characteristics of the detailed clay analysis by XRD.

Parameter	Value
Analysis	Clay extraction + XRD analysis
Sample preparation	Chemical pretreatment to remove cementing agents followed by an extraction of the <2 μ m fraction by sequential centrifugation.
Diffractometer	Bruker D8 Advance, XE-T detector, Cu-K α radiation
Data treatment methodology	In-house
Interpretation by	Dr. Rieko Adriaens
Date of measurement	20/05/2022-30/05/2022
Date of data treatment	30/06/2022
Results	Table 7 and Figures 2-7

Table 4: Measurement characteristics of the BET analysis.

Parameter	Value
Analysis	Multiple point BET
Instrument	Quantachrome Autosorb
Date of analysis	25/05/2022-11/07/2022
Operator	A.A.
Sample preparation	Outgassing for 2h in 200°C under high-vacuum
Adsorptive-gas	N ₂
Temperature during analysis	77.35K (liquid nitrogen)
Results	Table 8

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Table 5: Exchangeable cations composition.

Parameter	Value
Analysis	Chemical analysis of exchangeable cations
Sample preparation	Extraction of the <2µm fraction by sequential centrifugation.
Diffractometer	Bruker D8 Advance, XE-T detector, Cu-Kα radiation
Data treatment methodology	In-house
Interpretation by	Dr. Rieko Adriaens
Date of measurement	24/05/2022-30/05/2022
Date of data treatment	02/07/2022
Results	Table 9

Table 6: Quantitative bulk mineralogical composition (in wt% of the identified minerals).

Sample	Formula	11207091.8 Blija	11207091.8 Klutenplas	11207091.8 Kwelder Dept
NON-CLAYS				
SILCATES				
Quartz	SiO ₂	40.1	33.1	41.5
Alkali feldspar	(K,Na)Si ₃ AlO ₈	6.6	6.1	6.3
Plagioclase	(Ca,Na)(Si,Al) ₄ O ₈	5.9	5.2	6.3
CARBONATES				
Calcite	CaCO ₃	6.2	7.9	8.1
Dolomite/Ankerite	Ca(Mg,Fe)(CO ₃) ₂	1.6	1.5	1.4
OXIDES				
Anatase	TiO ₂	0.3	0.3	0.3
Rutile	TiO ₂	0.3	0.4	0.3
HALIDES				
Halite	NaCl			0.3
PHOSPHATES				
Apatite	Ca ₅ (PO ₄) ₃ (F,OH,Cl)	0.7	0.9	0.7
SULPHATES				
Gypsum	CaSO ₄ ·2H ₂ O		0.6	1.0
CLAYS				
Chlorite	(Mg,Fe) ₅ Al(Si ₃ Al)O ₁₀ (OH) ₈	4.0	3.8	3.5
Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	4.7	6.3	5.0
Total 2:1 layer silicates	(K,H ₃ O)(Al,Mg,Fe) ₂ (Si,Al) ₄ O ₁₀ [(OH) ₂ ,(H ₂ O)]	29.6	33.7	25.3
Of which estimated Illite/Muscovite 2M1 (di)		16.2	20.0	16.6
Of which estimated Smectite (di)		10.4	13.1	8.3
Of which estimated Illite/Smectite (di)		2.9	0.6	0.4

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Table 6: Continued

Sample	Formula	11207091.8 Valgenweg	11207091.8 Lauermeerdijk	11207091.8 Nieuwe Statenzijl
NON-CLAYS				
SILCATES				
Quartz	SiO ₂	38.8	54.3	38.3
Alkali feldspar	(K,Na)Si ₃ AlO ₈	6.6	6.3	6.0
Plagioclase	(Ca,Na)(Si,Al) ₄ O ₈	4.9	6.6	5.8
CARBONATES				
Calcite	CaCO ₃	8.3	7.2	6.9
Dolomite/Ankerite	Ca(Mg,Fe)(CO ₃) ₂	1.1	1.2	1.6
OXIDES				
Anatase	TiO ₂	0.3	0.3	0.4
Rutile	TiO ₂	0.3	0.4	0.4
HALIDES				
Halite	NaCl			0.0
PHOSPHATES				
Apatite	Ca ₅ (PO ₄) ₃ (F,OH,Cl)	0.9	0.5	0.6
SULPHATES				
Gypsum	CaSO ₄ ·2H ₂ O	0.1		
CLAYS				
Chlorite	(Mg,Fe) ₅ Al(Si ₃ Al)O ₁₀ (OH) ₈	3.8	2.7	4.1
Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	6.3	4.5	5.3
Total 2:1 layer silicates	(K,H ₃ O)(Al,Mg,Fe) ₂ (Si,Al) ₄ O ₁₀ [(OH) ₂ ,(H ₂ O)]	28.6	15.8	30.6
Of which estimated Illite/Muscovite 2M1 (di)		15.0	9.5	18.3
Of which estimated Smectite (di)		9.7	3.8	12.3
Of which estimated Illite/Smectite (di)		3.8	2.6	

Table 7: Quantitative clay mineralogical composition <2µm of the samples (in wt%).

Mineral	11207091.8 Blija	11207091.8 Klutenplas	11207091.8 Kwelder Dept	11207091.8 Valgenweg	11207091.8 Lauermeerdijk	11207091.8 Nieuwe Statenzijl
Kaolinite	7.1	10.4	10.5	13.9	13.7	11.2
Interstratified Illite/Smectite	31.5	27.7	34.9	27.6	34.4	32.1
Illite	17.7	21.8	19	28.1	27.4	21.6
Smectite	42.7	38.5	34.7	28.3	22.3	33.6
Chlorite	1	1.6	0.9	2.1	2.2	1.5

Your reference: "11207091.8 | Blija", "11207091.8 | Klutenplas", "11207091.8 | Kwelder Dept", "11207091.8 | Valgenweg", "11207091.8 | Lauermeerdijk", "11207091.8 | Nieuwe Statenzijl"
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Table 8: Multiple point BET analysis: results.

Sample	BET (m ² /g)
11207091.8 Blija	40.2
11207091.8 Klutenplas	25.1
11207091.8 Kwelder Dept	17.7
11207091.8 Valgenweg	18.7
11207091.8 Lauermeerdijk	11.5
11207091.8 Nieuwe Statenzijl	29.4

Table 9: Exchangeable cation analysis: results.

Sample	Na (meq/100g)	Ca (meq/100g)	K (meq/100g)	Mg (meq/100g)
11207091.8 Blija	14	24	9	2
11207091.8 Klutenplas	14	20	14	4
11207091.8 Kwelder Dept	13	16	15	4
11207091.8 Valgenweg	12	17	18	4
11207091.8 Lauermeerdijk	9	15	14	1
11207091.8 Nieuwe Statenzijl	4	14	11	2

Your reference: "11207091.8 | Blija", "11207091.8 | Klutenplas", "11207091.8 | Kwelder Dept", "11207091.8 | Valgenweg", "11207091.8 | Lauermeerdijk", "11207091.8 | Nieuwe Stanzijl"
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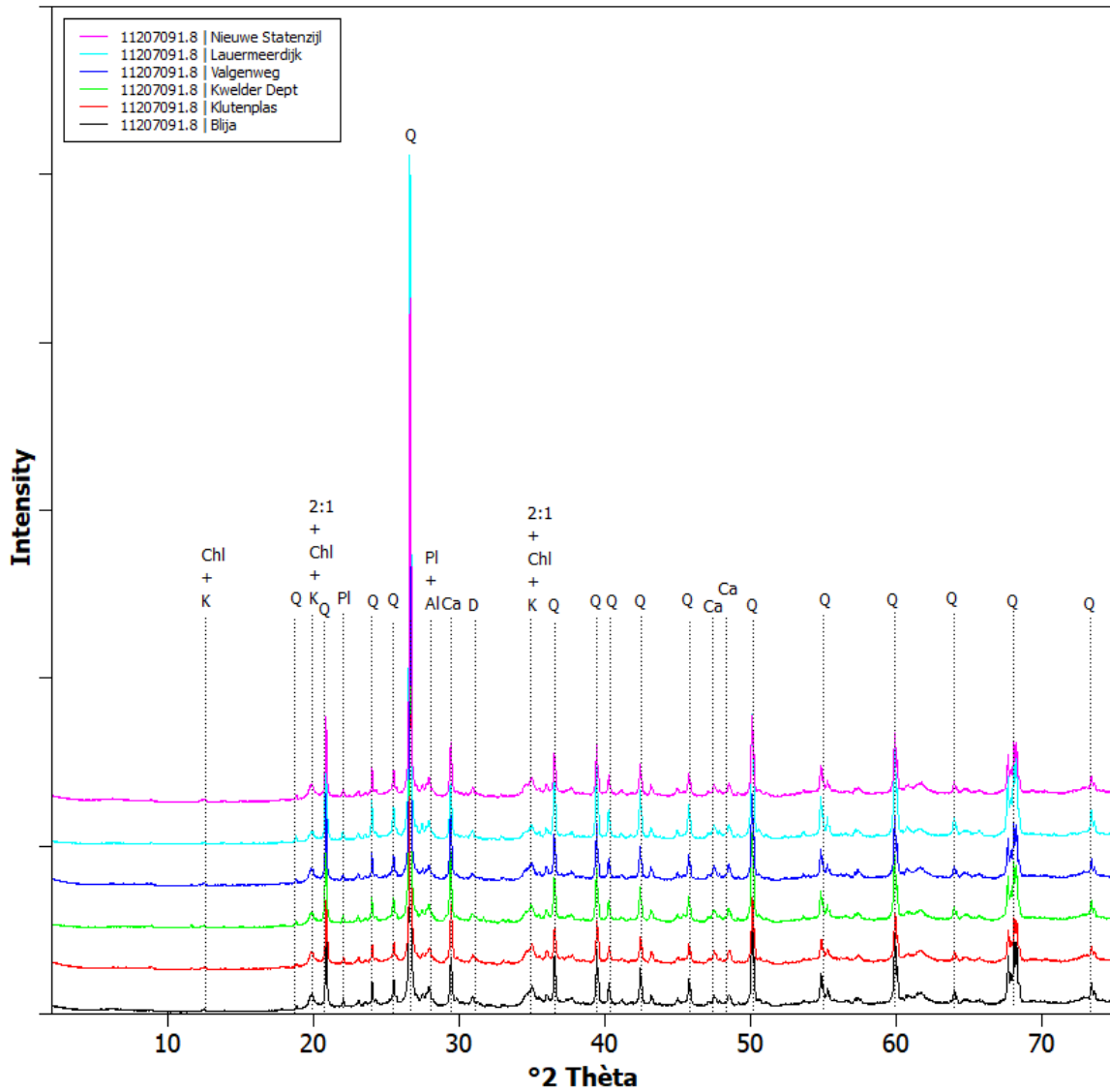


Figure 1: Diffraction patterns of the samples. The main minerals that contribute to the most important reflections are indicated: Quartz (Q), Chlorite (Chl), Kaolinite (K), 2:1 layer silicates (2:1), Plagioclase/Albite (Pl), Alkalifeldspar (Al), Calcite (Ca), Dolomite/Ankerite (D).

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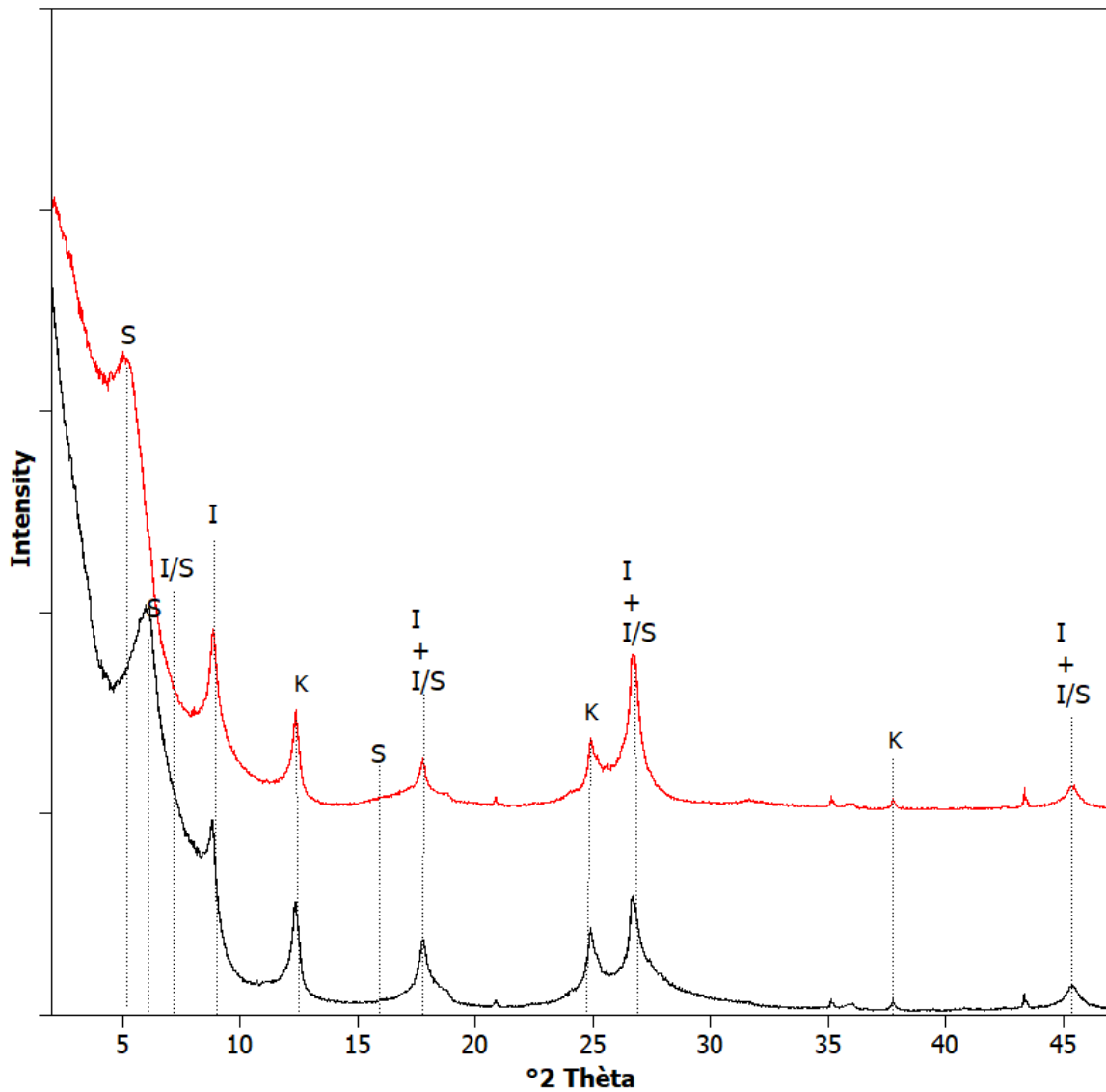


Figure 2: Diffraction patterns of the air dried (black pattern) and ethylene glycolated (red pattern) oriented clay fractions of the sample "11207091.8 | Blija". The most important reflections are labeled: K: Kaolinite, I: Illite, I/S: interstratified Illite/Smectite; S: Smectite.

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 Our reference: 2205AC

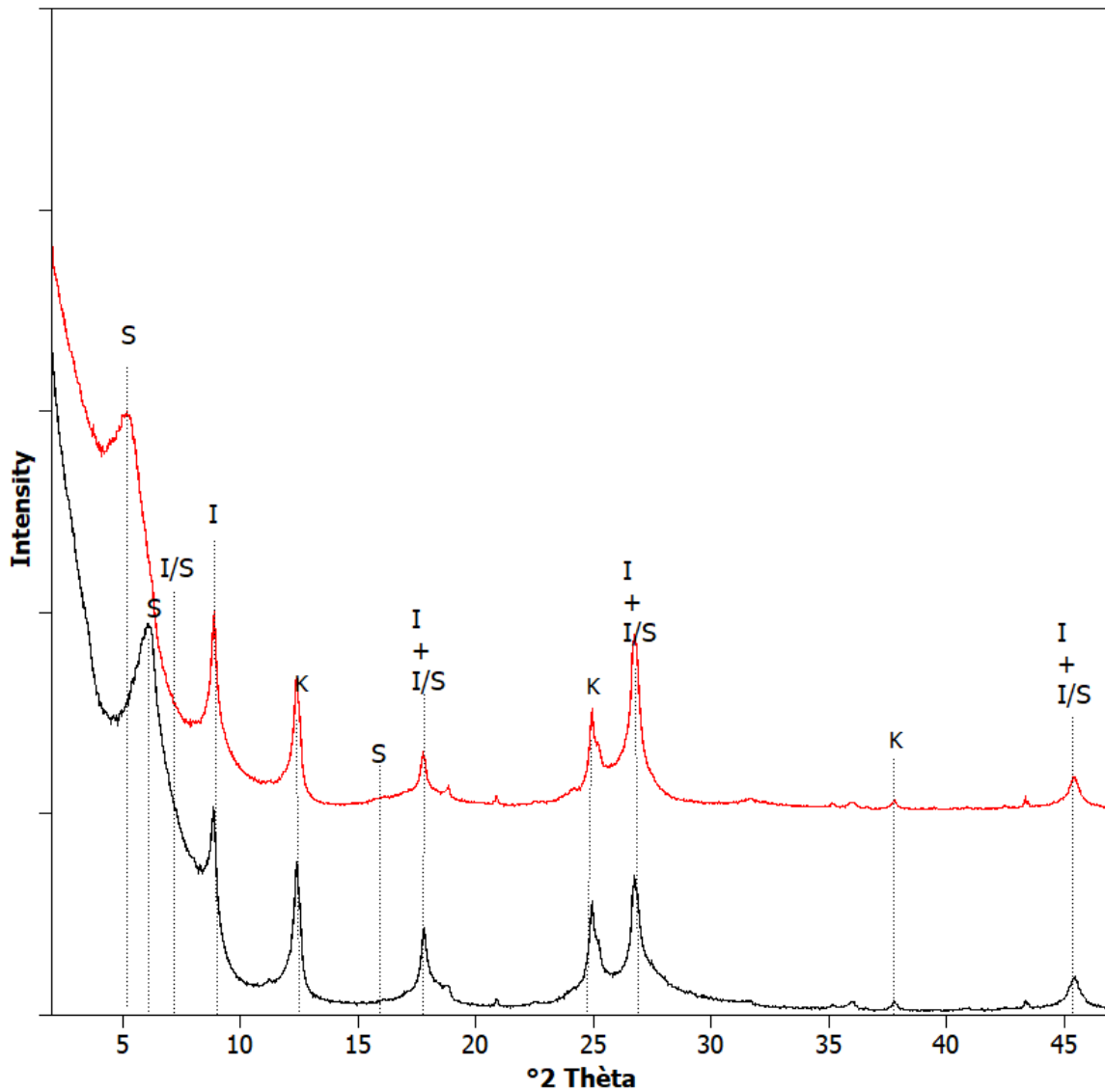


Figure 3: Diffraction patterns of the air dried (black pattern) and ethylene glycolated (red pattern) oriented clay fractions of the sample "11207091.8 | Klutenplas". The most important reflections are labeled: K: Kaolinite, I: Illite, I/S: interstratified Illite/Smectite; S: Smectite.

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 Our reference: 2205AC

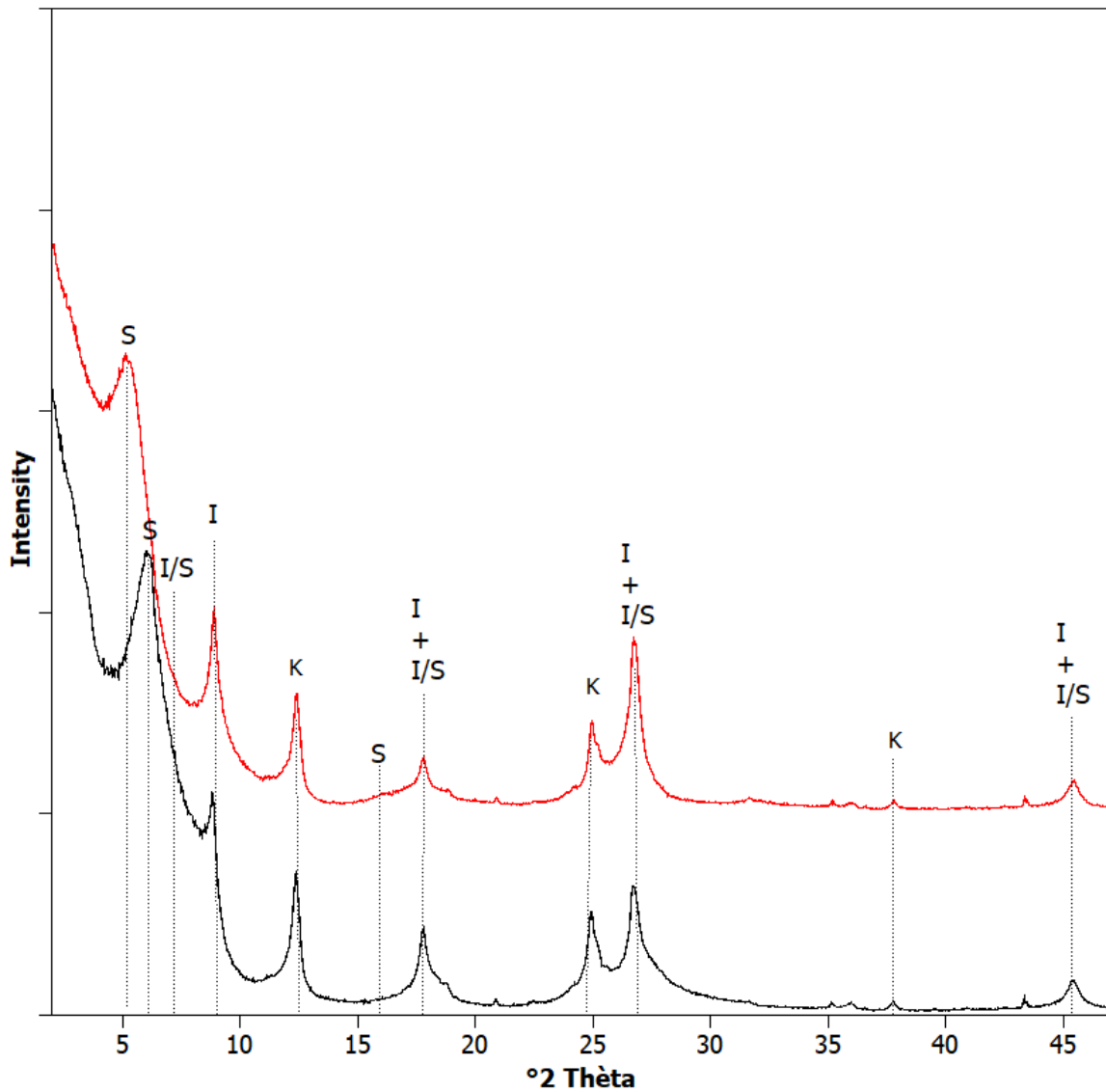


Figure 4: Diffraction patterns of the air dried (black pattern) and ethylene glycolated (red pattern) oriented clay fractions of the sample "11207091.8 | Kwelder Dept". The most important reflections are labeled: K: Kaolinite, I: Illite, I/S: interstratified Illite/Smectite; S: Smectite.

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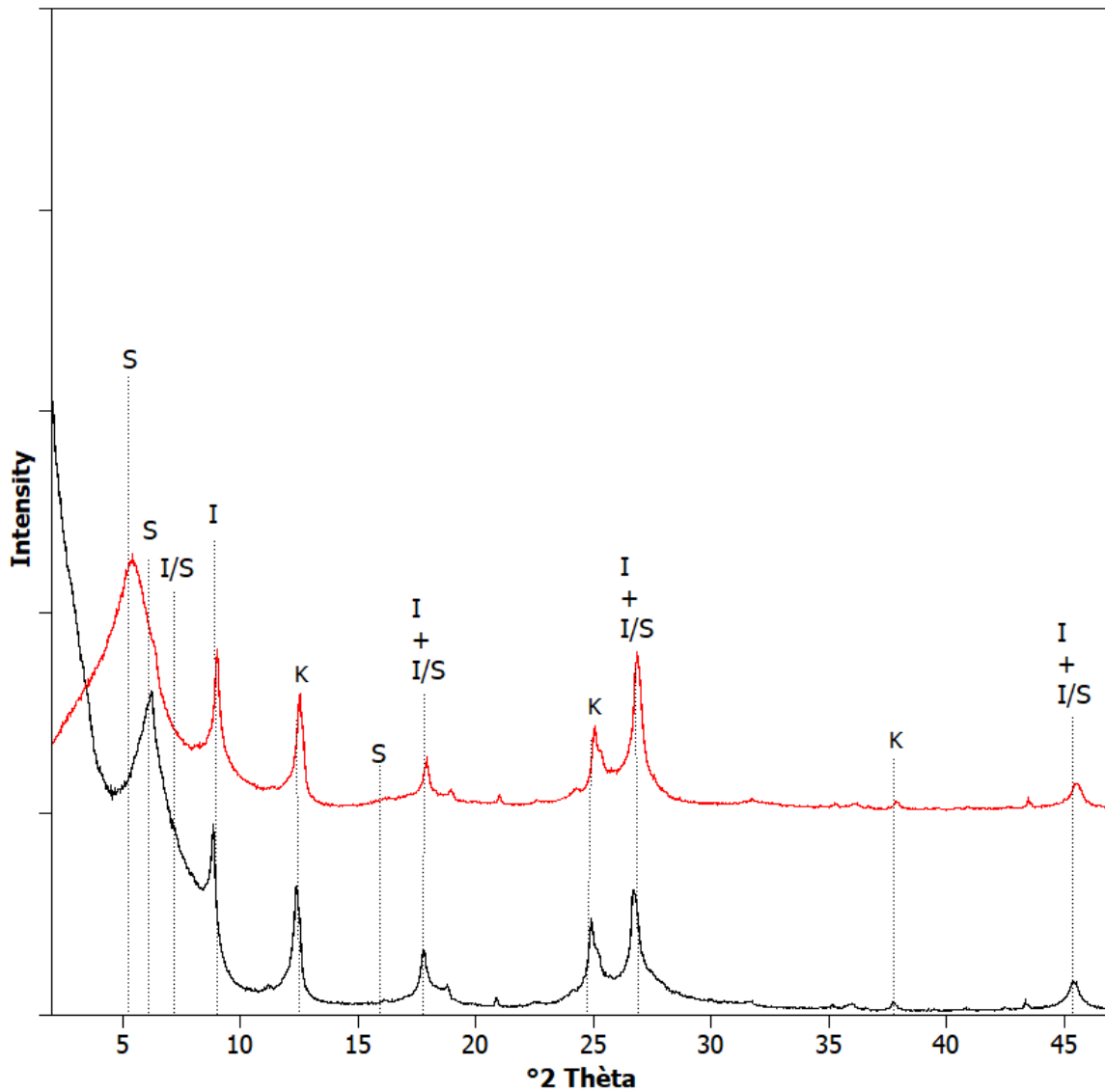


Figure 5: Diffraction patterns of the air dried (black pattern) and ethylene glycolated (red pattern) oriented clay fractions of the sample "11207091.8 | Valgenweg". The most important reflections are labeled: K: Kaolinite, I: Illite, I/S: interstratified Illite/Smectite; S: Smectite.

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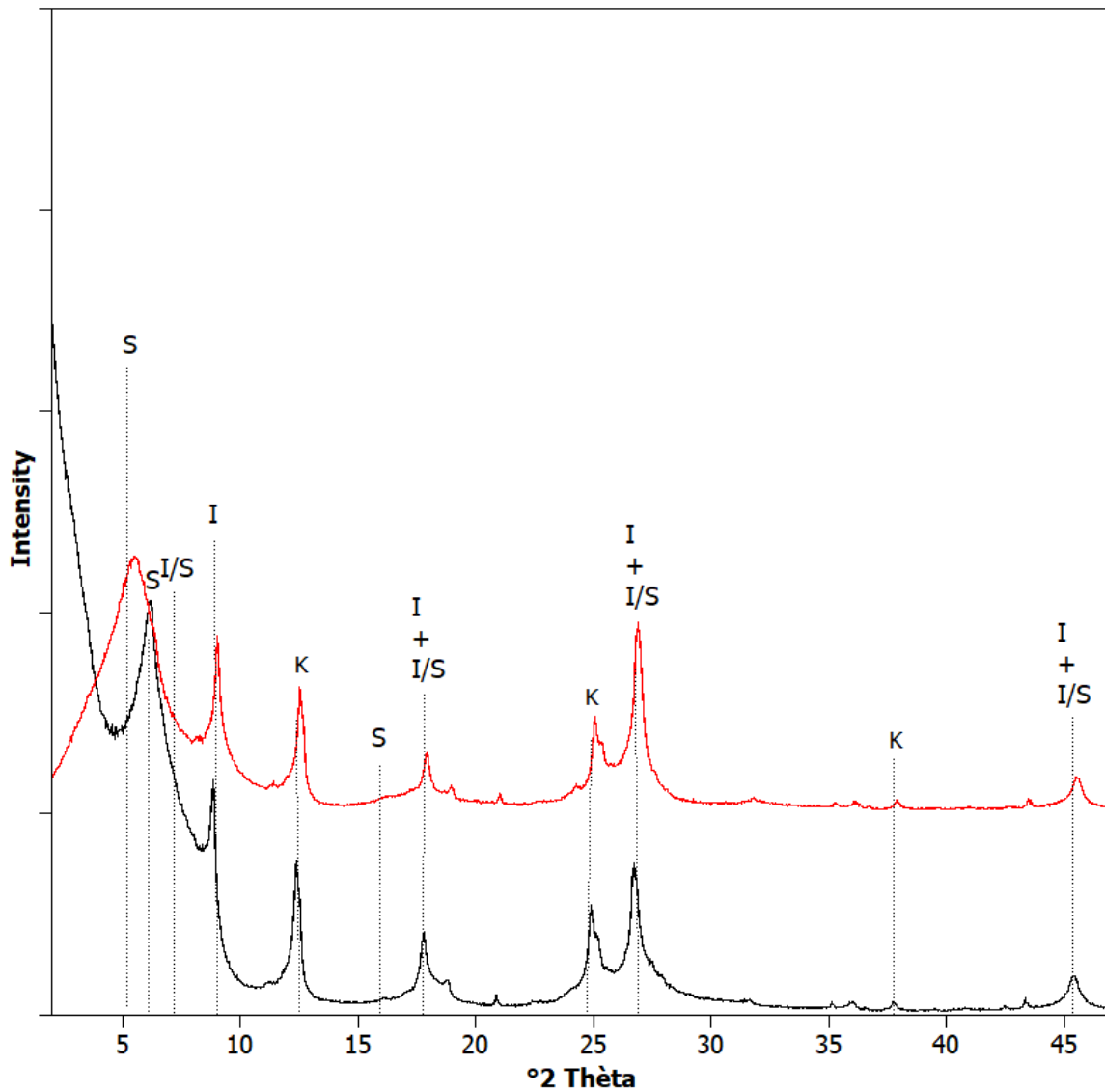


Figure 6: Diffraction patterns of the air dried (black pattern) and ethylene glycolated (red pattern) oriented clay fractions of the sample "11207091.8 | Lauermeerdijk". The most important reflections are labeled: K: Kaolinite, I: Illite, I/S: interstratified Illite/Smectite; S: Smectite.

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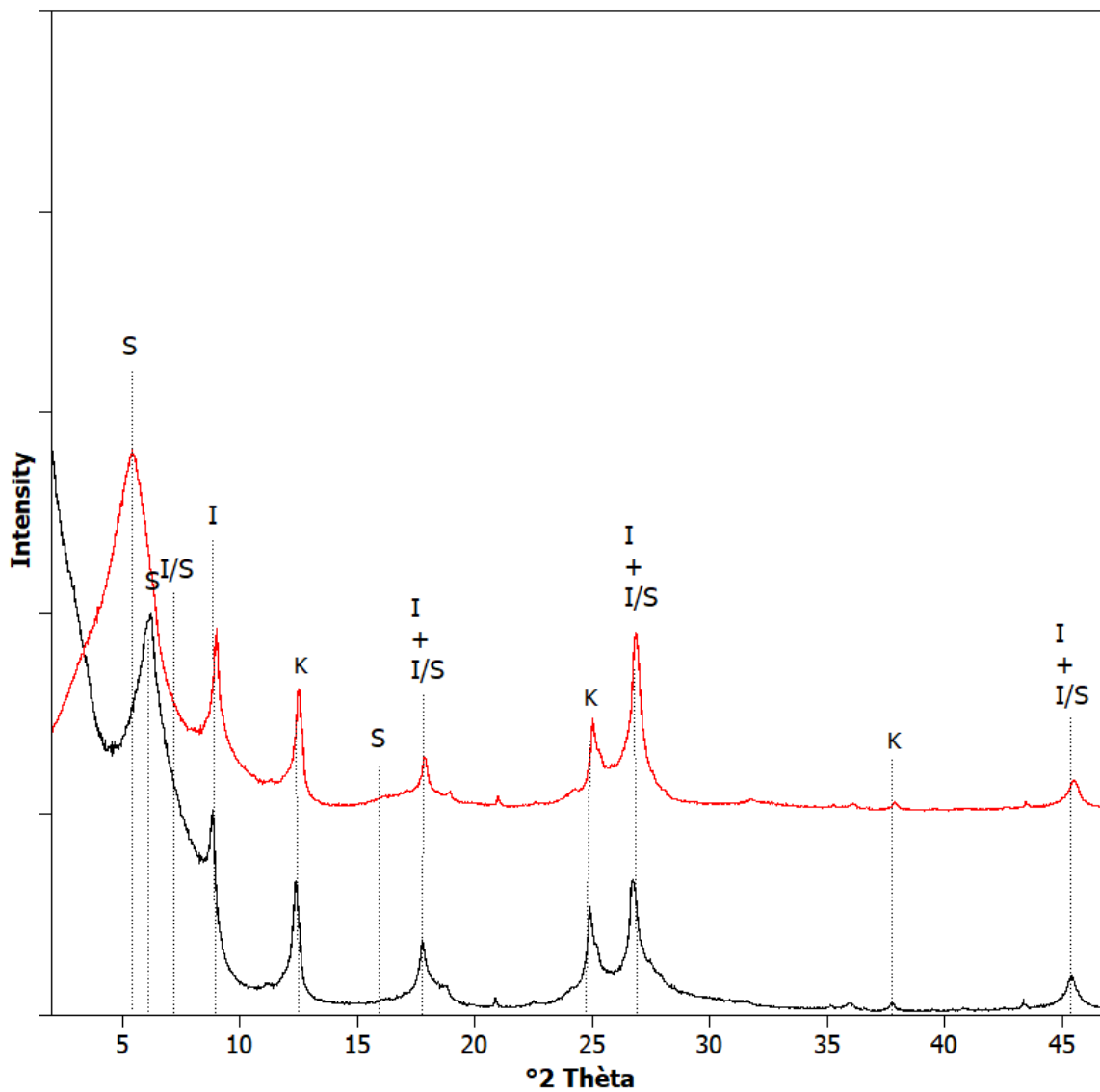


Figure 7: Diffraction patterns of the air dried (black pattern) and ethylene glycolated (red pattern) oriented clay fractions of the sample "11207091.8 | Nieuwe Stanzijl". The most important reflections are labeled: K: Kaolinite, I: Illite, I/S: interstratified Illite/Smectite; S: Smectite.