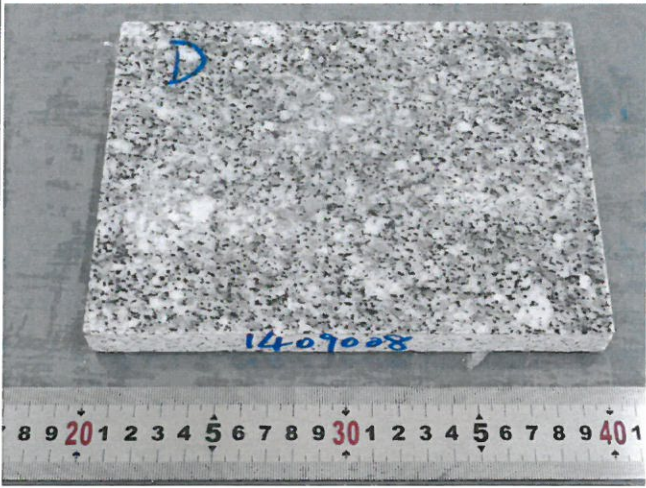


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<b>Kunden-Referenz-Nr.:</b> Client Reference No.:	N/A	<b>Auftragsdatum:</b> Order date:	<b>29.09.2014</b>	
<b>Auftraggeber:</b> Client:	ENTERPRISE 380 – PHU TAI JOINT STOCK COMPANY SECTION 5, TRAN QUANG DIEU WARD, QUY NHON CITY, BINH DINH PROVINCE, VIETNAM			
<b>Prüfgegenstand:</b> Test item:	Natural Stone Product			
<b>Bezeichnung / Typ-Nr.:</b> Identification / Type No.:	Type: PM WHITE GRANITE, Colour: WHITE, Serial No.: M3/32/4 Petrographic: Monzonite granite			
<b>Auftrags-Inhalt:</b> Order content:	Type examination			
<b>Prüfgrundlage:</b> Test specification:	EN 12057:2004 EN 12058:2004 EN 1469:2004 EN 1341:2012 EN 1342:2012 EN 1343:2012			
<b>Wareneingangsdatum:</b> Date of receipt:	16.09.2014			
<b>Prüfmuster-Nr.:</b> Test sample No.:	1409008			
<b>Prüfzeitraum:</b> Testing period:	28.09.2014 - 10.11.2014			
<b>Ort der Prüfung:</b> Place of testing:	See other			
<b>Prüflaboratorium:</b> Testing laboratory:	TÜV Rheinland (China) Ltd. Xiamen Branch			
<b>Prüfergebnis*:</b> Test result*:	Pass			
<b>geprüft von / tested by:</b>		<b>kontrolliert von / reviewed by:</b>		
<u>28.11.2014</u>	Luke Xu / PE	<u>28.11.2014</u>	Robert Xie / Reviewer	
<b>Datum</b> Date	<b>Name / Stellung</b> Name / Position	<b>Unterschrift</b> Signature	<b>Datum</b> Date	<b>Name / Stellung</b> Name / Position
<b>Sonstiges / Other:</b>				
TÜV Rheinland (China) Ltd. Xiamen Branch Laboratory of Regional Geological Survey Institute of Hebei Province				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
<b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				



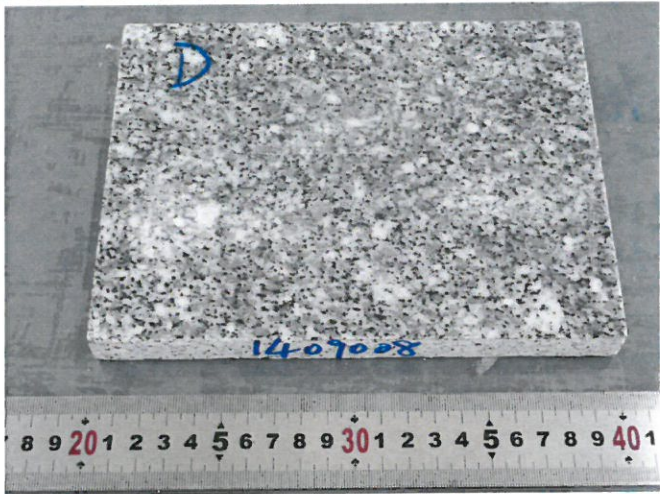


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**Produktbeschreibung**  
**Product description**

1	Type	PM WHITE GRANITE
2	Brand	N/A
3	Color	WHITE
4	Serial No.	M3/32/4
5	Petrographic	Monzonite granite
6	Quarry location	CHUA MOUNTAIN, MY HOA COMMUNE, PHU MY DISTRICT, BINH DINH PROVINCE, VIET NAM



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## 1. Apparent Density and Open Porosity

Test Period:	08.10.2014 - 11.10.2014
Test Method:	EN 1936:2006
Specimen Dimension:	50mm×50mm×50mm

Specimen No.	$m_d^{1)}$ (g)	$m_h^{2)}$ (g)	$m_s^{3)}$ (g)	Apparent Density ( $kg/m^3$ )	Open Porosity (%)
1	336.57	211.02	337.52	2660	0.8
2	339.58	213.03	340.50	2660	0.7
3	342.59	214.83	343.55	2660	0.7
4	344.01	215.81	344.96	2660	0.7
5	337.05	211.28	337.99	2650	0.7
6	331.94	208.16	332.85	2660	0.7
<b>Mean value</b>				2660	0.7

- 1) Mass of the dry specimen
- 2) Mass of the specimen immersed in water
- 3) Mass of the saturated specimen

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## 2. Water Absorption under Atmospheric Pressure

Test Period:	08.10.2014 - 13.10.2014
Test Method:	EN 13755:2008
Specimen Dimension:	50mm×50mm×50mm

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	m <sub>d</sub> <sup>1)</sup> (g)	m <sub>s</sub> <sup>2)</sup> (g)	Water Absorption (g)	Water Absorption Rate (%)	
							Based on Weight	Based on Volume
1	52.3	51.7	51.7	334.38	335.25	0.87	0.3	0.6
2	52.2	50.4	50.6	327.98	328.77	0.79	0.2	0.6
3	51.3	50.7	50.4	331.48	332.25	0.77	0.2	0.6
4	52.2	50.8	50.3	331.45	332.24	0.79	0.2	0.6
5	50.9	50.8	51.9	332.85	333.68	0.83	0.2	0.6
6	51.2	50.1	51.7	334.54	335.35	0.81	0.2	0.6
<b>Mean value</b>						0.81	0.2	0.6
<b>Higher expected value</b>						/	0.3	0.6

1) Mass of the dry specimen

2) Mass of the saturated specimen



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### 3. Abrasion Resistance

Test Period:	13.10.2014 - 15.10.2014
Test Method:	EN 14157: 2004 Method A - Wide wheel abrasion
Specimen Dimension:	150mm×100mm×20mm
Surface finish	Sawn
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Perpendicular to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy <input type="checkbox"/> Perpendicular to the edges of the planes of anisotropy

Specimen No.	Specimen Dimension			Mean Value of Groove Width after Calibration (mm)
	Length (mm)	Width (mm)	Thickness (mm)	
1	150.5	101.9	20.8	16.0
2	151.4	101.7	20.3	16.0
3	151.1	100.6	20.9	17.0
4	151.4	100.6	20.5	17.5
5	151.2	101.0	20.6	16.0
6	150.7	100.3	20.8	17.0
<b>Mean value</b>				16.6
<b>Higher expected value</b>				18.2

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#### 4. Slip Resistance by Means of the Pendulum Tester

Test Period:	16.10.2014
Test Method:	EN 14231:2003
Specimen Dimension:	200mm×150mm×20mm
Surface finish:	Medium ground

Specimen No.	Surface condition	Test result	Unit
1	Dry	64	SRT-Unit
2		62	
3		62	
4		62	
5		64	
6		62	
Temperature correction		0.2	
Mean value (SRV "dry")	Dry	63	SRT-Unit

Specimen No.	Surface condition	Test result	Unit
1	Wet	61	SRT-Unit
2		58	
3		58	
4		60	
5		60	
6		60	
Temperature correction		0.2	
Mean value (SRV "wet")	Wet	60	SRT-Unit



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## 5. Compressive Strength

Test Period:	20.10.2014 - 22.10.2014
Test Method:	EN 1926:2006
Specimen Dimension:	50mm×50mm×50mm
Surface finish:	Sawn
Loading Rate:	(1.0 ± 0.5) MPa/s
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Normal to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy

Specimen No.	Specimen Dimension (mm)			Load (kN)	Compressive Strength (MPa)
	Length	Width	Thickness		
1	50.6	50.1	50.0	247	97
2	50.6	49.6	50.6	145	58
3	51.6	49.8	51.0	199	77
4	50.7	50.2	50.2	260	102
5	50.2	49.8	50.7	182	73
6	50.9	50.0	50.1	277	109
7	50.6	50.4	50.2	227	89
8	51.0	50.0	51.0	226	89
9	50.2	49.9	50.2	186	74
10	50.4	49.6	50.6	164	66
<b>Mean Value (MPa)</b>					83
<b>Standard Deviation (MPa)</b>					16
<b>Variation Coefficient</b>					0.19
<b>Lower expected value (MPa)</b>					54



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## 6. Flexural Strength

Test Period:	20.10.2014 - 22.10.2014
Test Method:	EN 12372:2006
Specimen Dimension:	300mm×50mm×50mm
Surface finish:	Sawn
Loading Rate:	(0.25 ± 0.05) MPa/s
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Perpendicular to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy <input type="checkbox"/> Perpendicular to the edges of the planes of anisotropy

Specimen No.	Span	Fracture Plane (mm)		Fracture Position <sup>1)</sup>	Fracture Orientation <sup>2)</sup>	Load (N)	Flexural Strength (MPa)
		Width	Thickness				
1	250	50.0	51.0	m	r	5800	16.7
2	250	50.0	51.3	m	r	5860	16.7
3	250	50.1	50.0	m	r	6020	18.0
4	250	50.9	49.5	m	r	5910	17.8
5	250	50.3	50.2	m	r	5710	16.9
6	250	50.3	49.6	m	r	6140	18.6
7	250	50.0	50.3	m	r	6000	17.8
8	250	50.2	50.4	m	r	6200	18.2
9	250	50.0	50.2	m	r	6220	18.5
10	250	51.4	49.8	m	r	6610	19.4
<b>Mean Value (MPa)</b>							17.9
<b>Standard Deviation (MPa)</b>							0.9
<b>Variation Coefficient</b>							0.05
<b>Lower expected value (MPa)</b>							16.1

1) "m" = ca. middle between supports, "number" = ca. distance to support.

2) "r" = ca. rectangular to sample piece, "sch" = sloped to sample axis, "F" = surface defect in area of breaking.

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## 7. Frost Resistance

Test Period:	28.09.2014 - 28.10.2014
Test Method:	EN 12371:2010
Specimen Dimension:	50mm×50mm×50mm
Freezing-thawing cycles:	56

Specimen No.	Change in Apparent Volume after Freezing-thawing cycles (%)
1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0

### Observation depends on appearance

During frost-thaw-cycles:	Intact
After frost-thaw-cycles:	Intact



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## 8. Compressive Strength after Freezing-thawing cycles

Test Period:	30.10.2014 - 03.11.2014	Specimen Dimension:	50mm×50mm×50mm
Test Method:	EN 12371:2010 & EN 1926:2006	Freezing-thawing cycles:	56
Loading Rate:	(1.0 ± 0.5) MPa/s	Surface finish:	Sawn
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Normal to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy		

Specimen No.	Specimen Dimension (mm)			Load (kN)	Compressive Strength (MPa)
	Length	Width	Thickness		
1	50.8	50.6	49.7	269	105
2	50.6	50.1	50.2	262	103
3	50.7	50.0	50.4	111	44
4	51.0	50.7	49.9	287	111
5	51.1	50.1	50.2	227	89
6	50.5	49.8	50.1	206	82
7	50.0	49.8	50.6	259	104
8	50.4	50.1	50.2	240	95
9	50.8	50.2	50.1	72	28
10	50.6	50.1	50.0	348	137
<b>Mean Value (MPa)</b>					90
<b>Standard Deviation (MPa)</b>					32
<b>Variation Coefficient</b>					0.36
<b>Lower expected value (MPa)</b>					30

### The test comparison under frost affect:

Without Frost	Mean Value	83MPa
After Frost	Mean Value	90MPa
Change in Compressive Strength		-8.4%

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## 9. Flexural Strength after Freezing-thawing cycles

Test Period:	30.10.2014 - 03.11.2014	Specimen Dimension:	300mm×50mm×50mm
Test Method:	EN 12371:2010 & EN 12372:2006	Freezing-thawing cycles:	56
Loading Rate:	(0.25 ± 0.05) MPa/s	Surface finish:	Sawn
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Perpendicular to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy <input type="checkbox"/> Perpendicular to the edges of the planes of anisotropy		

Specimen No.	Span	Fracture Plane (mm)		Fracture Position	Fracture Orientation	Load (N)	Flexural Strength (MPa)
		Width	Thickness				
1	250	50.6	50.5	m	r	5890	17.1
2	250	50.2	50.6	m	r	5580	16.3
3	250	50.3	51.0	m	r	5570	16.0
4	250	51.2	50.7	m	r	5330	15.2
5	250	51.8	50.1	m	r	5690	16.4
6	250	50.9	49.8	m	r	5760	17.1
7	250	50.3	50.5	m	r	5680	16.6
8	250	50.5	50.5	m	r	5650	16.5
9	250	50.6	49.7	m	r	5320	16.0
10	250	50.4	49.8	m	r	5880	17.6
<b>Mean Value (MPa)</b>							16.5
<b>Standard Deviation (MPa)</b>							0.7
<b>Variation Coefficient</b>							0.04
<b>Lower expected value (MPa)</b>							15.1

### The test comparison under frost affect:

Without Frost	Mean Value	17.9MPa
After Frost	Mean Value	16.5MPa
Change in Flexural Strength		7.8%



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## 10. Breaking Load at Dowel Hole

Test Period:	06.11.2014 - 10.11.2014	Hole Diameter:	10mm
Test Method:	EN 13364:2001	Dowel Diameter:	6mm
Specimen dimension:	200mm×200mm×30mm	Anchoring Depth:	25mm
Loading Rate:	(50 ± 5) N/s	Anchoring of Dowel:	in cement
Surface finish:	Sawn	Bearing Length:	120mm
Load Type:	<input checked="" type="checkbox"/> Isotropic specimen <input type="checkbox"/> Perpendicular to the planes of anisotropy <input type="checkbox"/> Parallel to the planes of anisotropy <input type="checkbox"/> Perpendicular to the edges of the planes of anisotropy		

Specimen No.	Specimen thickness	Fragment dimension (mm)		Breaking Load (N)
		Distance from hole to face, $d_1$	Max distance from hole center to edge, $b_A$	
1	30.2	10.4	54.5	2650
2	30.2	9.7	43.9	1850
3	30.4	10.1	40.4	1650
4	30.6	10.3	44.7	1700
5	31.1	10.1	47.5	1750
6	31.0	10.3	30.9	1600
7	31.0	9.6	41.8	1750
8	31.2	9.5	44.0	1650
9	30.8	10.2	36.7	1800
10	30.7	10.4	45.0	1750
<b>Mean Value</b>		10.1	42.9	1800
<b>Standard Deviation (N)</b>				303
<b>Variation Coefficient</b>				0.17
<b>Lower Expected Value (N)</b>				1329

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## 11. Petrographic Examination

Test Period:	04.11.2014 - 05.11.2014
Test Method:	EN 12407:2007
Specimen Dimension:	10cm×10cm×3cm, 2pcs

**CLASSIFICATION: Monzonite granite**

### HAND SAMPLE DESCRIPTION

Very strong, fresh, almost gray white, several dark minerals and opaque particles spreader over the rock fabric in disorder. It is not easily scored with a penknife.

### MICROSCOPIC DESCRIPTION

Texture	Fine-medium grained granitic texture
Structure	Massive structure
Major ingredient	Potash feldspar (30~35%), Plagioclase (35~40%), Quartz (20%), Biotite (10%) · Amphibole(small amount)
Accessory mineral	Metallic(opaque) particles, Apatite,Allanite,Sphene
Secondary mineral	Clay, Chlorite, Kaolinite,Epidote

MATERIAL COMPONENT	PETROGRAPHIC DETAILS
Potash feldspar	Xenomorphic granular, which grain sizes are usually 2~5mm, partial 0.5~2mm, occasionally 5~7mm,contain plagioclase inclusions and biotite inclusions,slight kolinitization, twin lattice can be seen,replace plagioclase partially,messy distribution.
Plagioclase	Hypautomorphic platy, which grain sizes are usually 2~4mm, partial 0.2~2mm, slight clayzation, the area where contact to potash feldspar shows myrmekitic texture and net-edge structure,zonal structure can be seen, messy distribution.
Quartz	Xenomorphic granular, which grain sizes are usually 0.2~2mm, partial 2~3.5mm, undulatory extinction, messy distribution.
Biotite	Flaky, brown,which grain sizes are usually 0.2~1.5mm, replaced by chlorite and epidote partially, replace amphibole occasionally,scattered distribution.
Amphibole	Xenomorphic Column-granular,which grain sizes are usually 0.2~0.6mm, replaced by biotite partially,scattered distribution.



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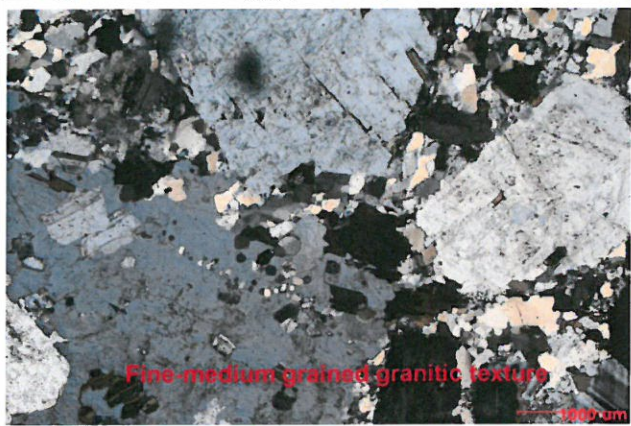

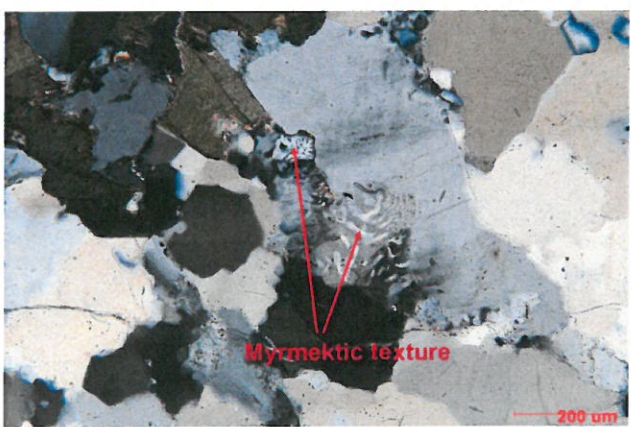
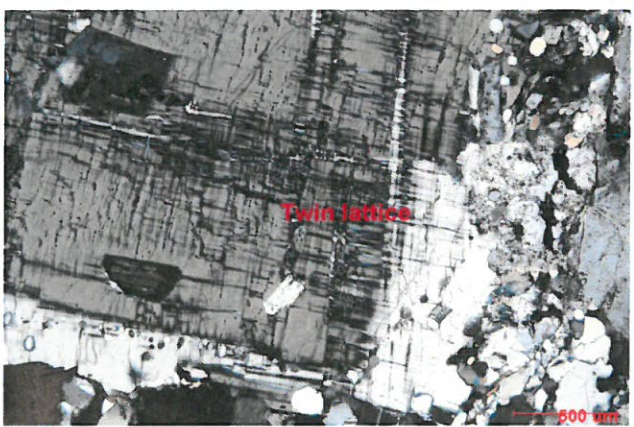
**Alterations:**

Slightly. Chloritization ,clayzation , kolinitization and epidotization can be seen partially in the rock. Quartz aggregates takes on spiccato strigae and lens when they distribute concentration relative.

**Remarks:**

The rock is composed of potash feldspar, plagioclase, quartz ,biotite and amphibole.According to mineral component , texture and structure of the rock,we named it fine-medium grained biotite **monzonite granite**. It belongs to volcanic rock(acidic intrusive rock).

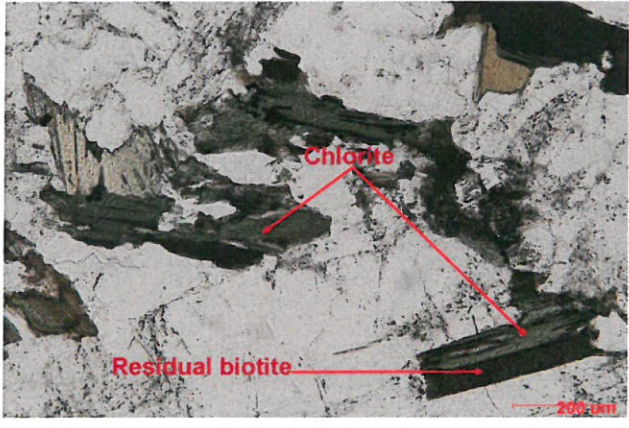
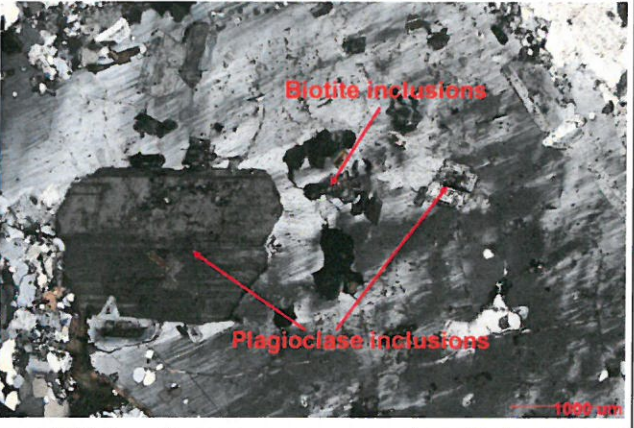
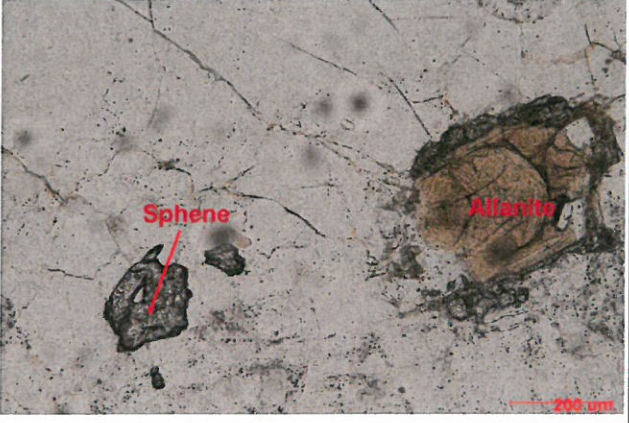
**Photomicrographs**

Fine-medium grained granitic texture (Crossed polarizers)	Zonal texture of plagioclase (Crossed polarizers)
	
Myrmekitic texture(Crossed polarizers)	Twin lattice(Crossed polarizers)
	



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<p>Biotite are replaced by chlorite partially(Plain light)</p>	<p>Plagioclase inclusions and biotite inclusions in Potash feldspar. (Crossed polarizers)</p>
	
<p>Sphene, allanite (Plain light)</p>	<p>BLANK</p>
	

Note: The test of petrographic examination was carried out in an external laboratory of TÜV Rheinland.

**END OF TEST REPORT**