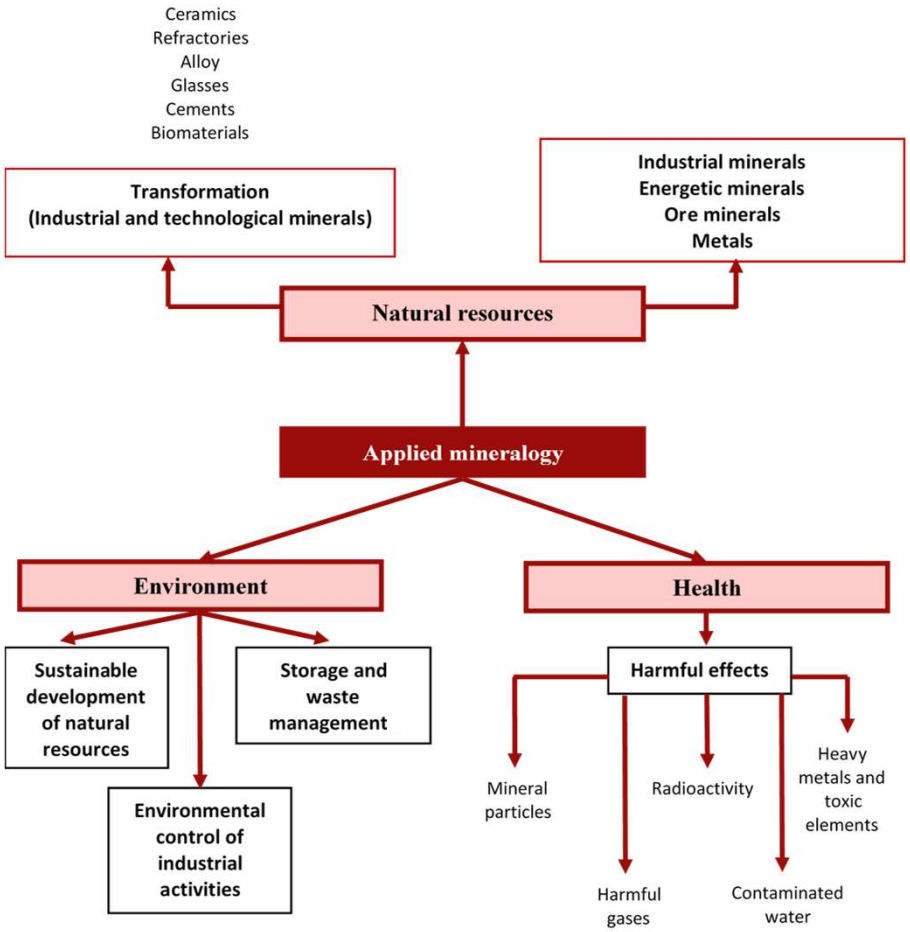
QuantiROCK (IMDEEA/2019/28)

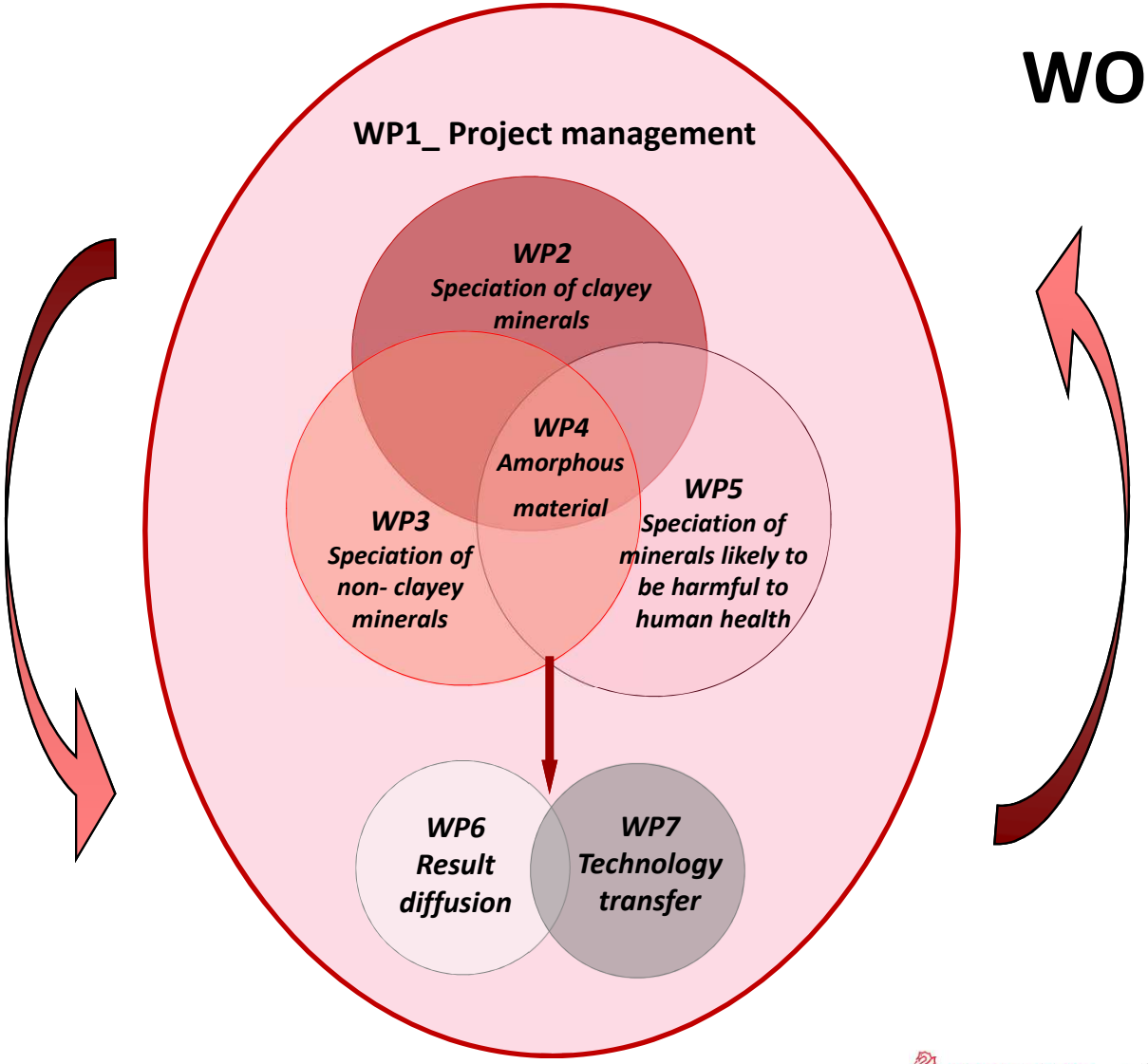
Strategy of mineral speciation and quantification by advanced spectroscopic techniques

GENERAL OBJECTIVE



To define **new specification and quantification product strategies**, obtaining specific control and characteritzarion lab procedures of rocks and materials with a total or partial clay nature.

WORKING PLAN



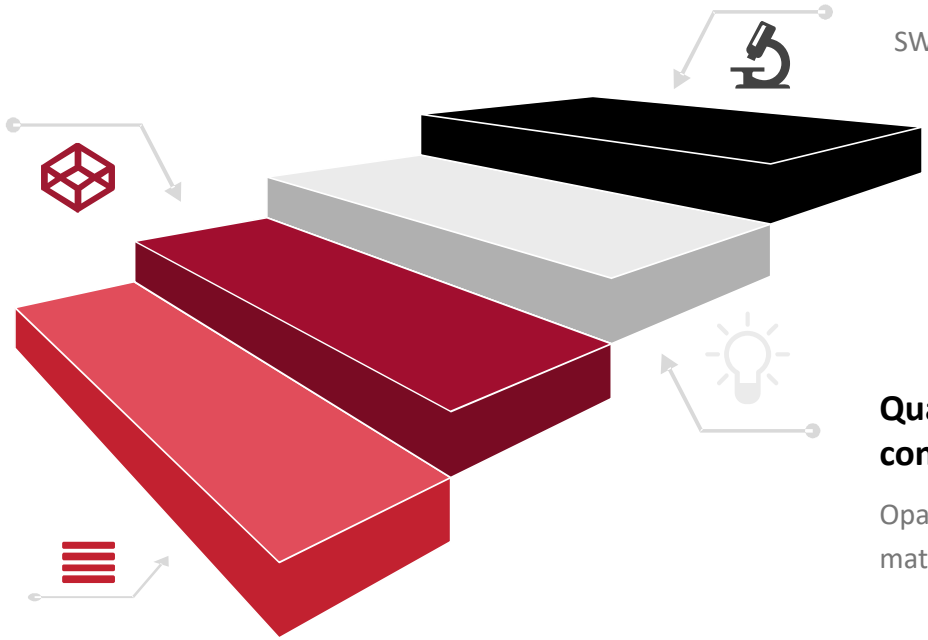
SPECIFIC OBJECTIVES

Speciation and quantification of minerals harmful to human health

SWeRFcs and asbestos minerals

Speciation and quantification of non-clayey minerals

Feldspars, carbonates and silica



Quantification of amorphous content

Opal, diatomeous earth, organic material, hydroxides, iron gel

Speciation and quantification of clayey minerals

Di and trioctahedral phyllosilicates of different typologies

WP2: SPECIATION OF CLAYEY MINERALS

Group	Structure	Mineral	Formula
Phyllosilicates 1:1 Kaolinite and serpentine	Dioctahedral	Kaolinite, Dickite, Nacrite, Halloysite	$Al_2Si_2O_5(OH)_4$
	Trioctahedral	Crisotile Antigorite Lizardite	$Mg_3Si_2O_5(OH)_4$
Phyllosilicates 2:1 Without intelaminar cations	Dioctahedral	Pirophyillite	$Si_4Al_2O_{10}(OH)_2$
	Trioctahedral	Talc	$Si_4Mg_3O_{10}(OH)_2$
Phyllosilicates 2:1 Mica and illite	Dioctahedral	Muscovite Paragonite Illite Glauconite	$KAl_2(Si_3Al)O_{10}(OH)_2$ $NaAl_2(Si_3Al)O_{10}(OH)_2$ $K(Al_{1.75,}(R^{2+})_{0.25}(Si_{3.5}Al_{0.5})O_{10}(OH)_2$ $K(R^{3+})_{1.33}(R^{2+})_{0.67}(Si_{3.7}Al_{0.3})O_{10}(OH)_2$
	Trioctahedral	Phlogopite Biotite	$KMg_3(Si_3Al)O_{10}(OH)_2$ $K(Mg,Fe)_3(Si_3Al)O_{10}(OH)_2$
Phyllosilicates 2:1 Smectite	Dioctahedral	Montmorillonite Beidellite Nontronite	$Al_{2-y}Mg_ySi_4O_{10}(OH)_2 \cdot yH_2O$ $Al_2(Si_{4-x}Al_x)O_{10}(OH)_2 \cdot xH_2O$ $Fe^{3+}{}_2(Si_{4-x}Al_x)O_{10}(OH)_2 \cdot xH_2O$
	Trioctahedral	Saponite Hectorite	$Mg_{3-y}(Al,Fe)_y(Si_{4-x}Al_x)O_{10}(OH)_2 \cdot yH_2O$ $(Mg_{3-y}Li_y)Si_4O_{10}(OH)_2 \cdot yH_2O$
Phyllosilicates 2:1 Vemiculite	Trioctahedral	Vermiculite	$Mg_x(Mg,Al,Fe)_3(Si,Al)_4O_{10}(OH)_2 \cdot nH_2O$
Phyllosilicates 2:1:1 Clinochlore	Dioctahedral	Dombasite	$Al_{4+x/3}(Si_{4-x}Al_x)_3O_{10}(OH)_8$
	Trioctahedral	Clinochlore Chamosite	$(Mg_5Al)(Si_3Al)O_{10}(OH)_8$ $(Fe_5Al)(Si_3Al)O_{10}(OH)_8$
	Di-trioctahedral	Cookeite Sudoite	$(LiAl_4)(Si_3Al)O_{10}(OH)_8$ $(Al_{2.7}Mg_{2.3})(Si_{3.3}Al_{0.7})O_{10}(OH)_8$
Fibrous Phyllosilicates Sepiolite y paligorskite	---	Sepiolite Paligorskite	$(M_{5-y-z}R_y{}^3[]_z)Si_{12-x}R_x{}^{3+})O_{30}(OH)_4(H_2O)_4R^{2+}{}_{(x-y+2z)/2} \cdot (H_2O)_8$ $(M_{5-y-z}R_y{}^3[]_z)Si_{8-x}R_x{}^{3+})O_{20}(OH)_2(H_2O)_4R^{2+}{}_{(x-y+2z)/2} \cdot (H_2O)_4$
Interestratifyed minerals	Dioctahedral	Rectorite Tosudite	Illite/esmectite Chlorite/smectite
	Trioctahedral	Alietite	Talc/saponite

WP2: SPECIATION OF CLAYEY MINERALS

X-Ray diffraction
(oriented aggregates)

Preffered orientation

Chemical analysis

Elemental composition

Scanning electron microscopy

Microstructure and particle shape

X-Ray diffraction

Mineral structures

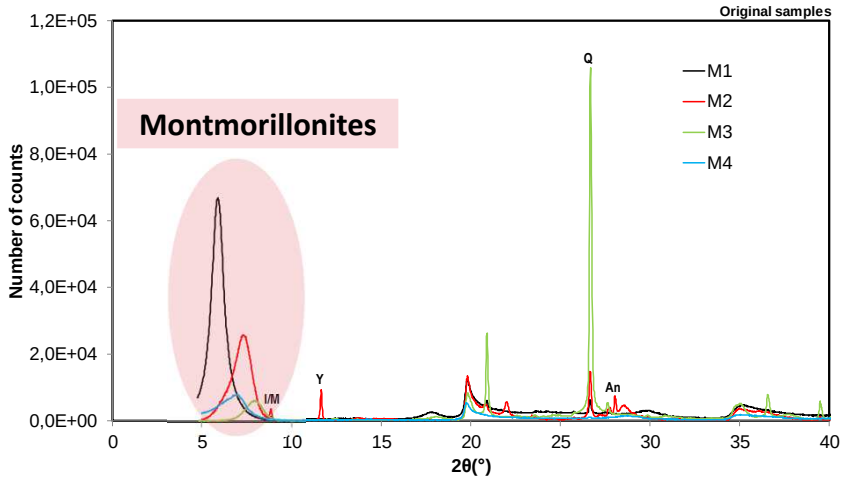
EGA-TGA

Gas emission

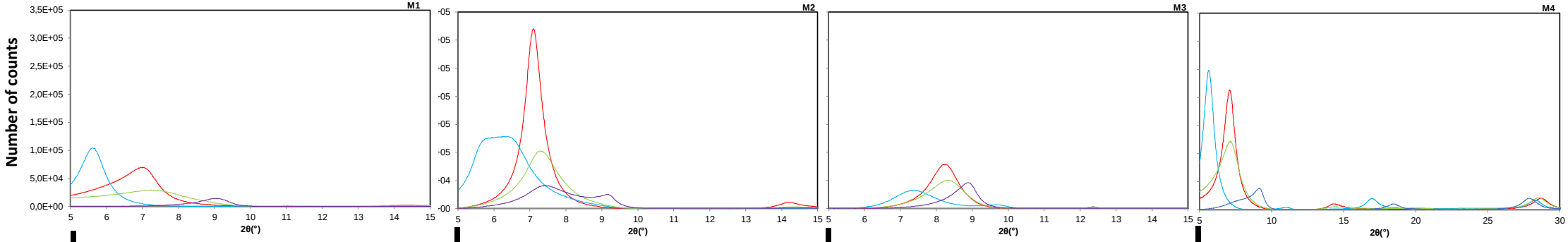
Optical microscopy

Textures, external aspect, shine

WP2: SPECIATION OF CLAYEY MINERALS



- Oriented aggregates
- Or. Agg. Glicolated
- Or. Agg. Gl. treated at 350°C
- Or. Agg. Gl. treated at 550°C



96 %

82 %

Ca-Montmorillonite

$Ca_{0.3}Al_{1.3}Fe_{0.1}Mg_{0.6}Si_4O_{10}(OH)_2 \cdot 5H_2O$

20 %

Na-Montmorillonite

$Na_{0.2}Al_{1.4}Fe_{0.2}Mg_{0.3}Si_4O_{10}(OH)_2 \cdot 2H_2O$

100 %

Regular interstratified illite-vermiculite

$Mg_xAl_{1.2}Fe_{0.2}Mg_{0.6-x}Si_4O_{10}(OH)_2 \cdot 2H_2O$

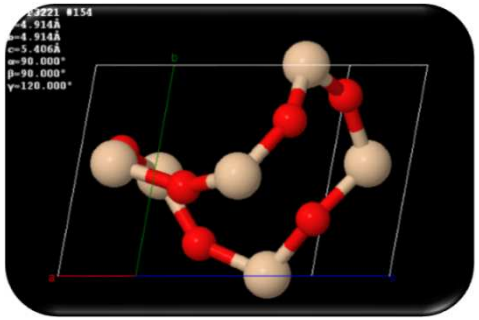
Na,Ca- montmorillonite (Low crystallinity)

$Na_{0.3}Ca_{0.1}Al_{1.4}Fe_{0.1}Mg_{0.5}Si_4O_{10}(OH)_2 \cdot 3H_2O$

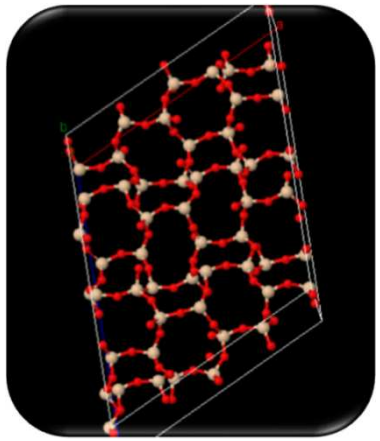
WP3 and WP4: SPECIATION OF NON-CLAYEY MINERALS

Group	Structure	Minerals	Formula
Feldspars	Feldspar	Albite	$NaAlSi_3O_7$
		Anorthite	$CaAlSi_3O_7$
		Orthoclase	$KAlSi_3O_7$
		Celsian	$BaAlSi_3O_7$
	Feldespathoid	Nepheline	$Na_3KAl_4Si_4O_{16}$
Silica	Crystalline (Polymorphs)	Quartz	SiO_2
		Tridymite	SiO_2
		Cristobalite	SiO_2
Carbonates	Hexagonal	Calcite	$CaCO_3$
		Dolomite	$(Ca,Mg)CO_3$
		Magnesite	$MgCO_3$
	Orthorhombic	Witherite	$BaCO_3$

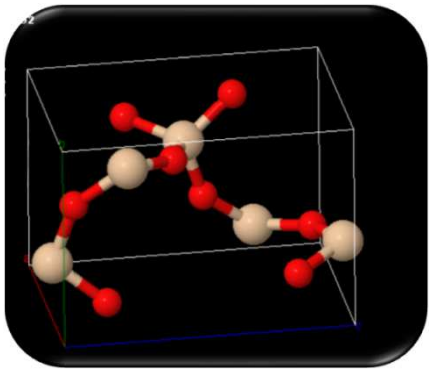
Quartz
(Trigonal SiO_2)

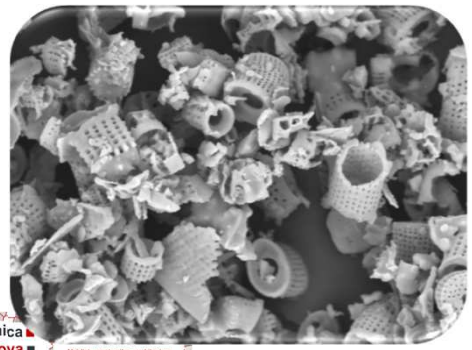


Tridymite
(Rhombic SiO_2)



Cristobalite
(Tetragonal SiO_2)

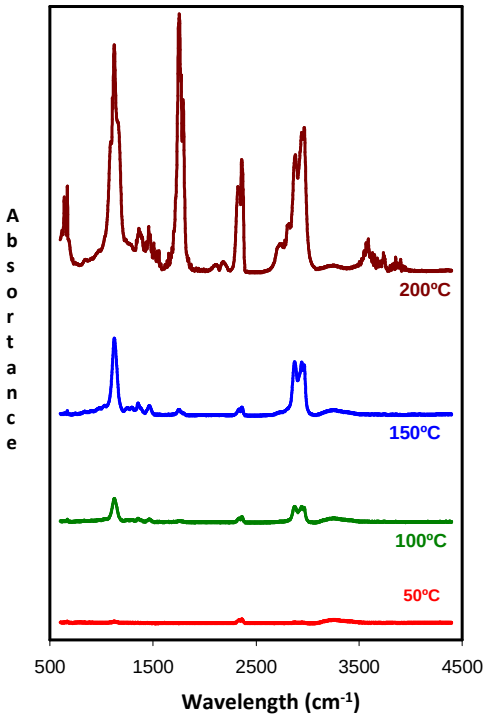


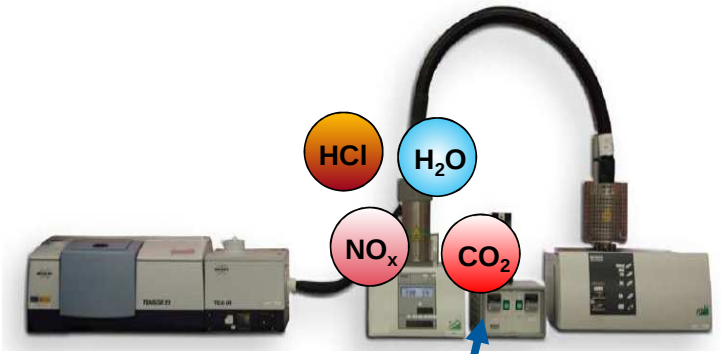


Diatomeaceous earth
(amorphous SiO_2)

Opal
($SiO_2 \cdot nH_2O$)

WP3: SPECIATION OF NON-CLAYEY MINERALS





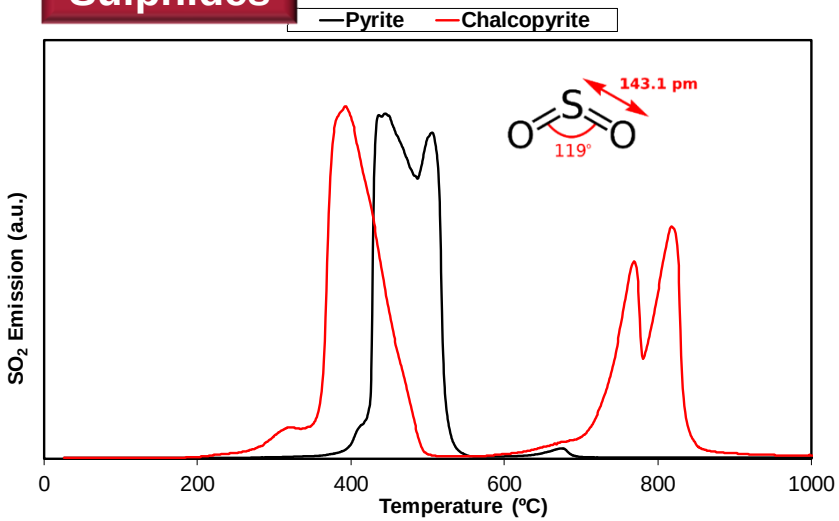
HF

FTIR

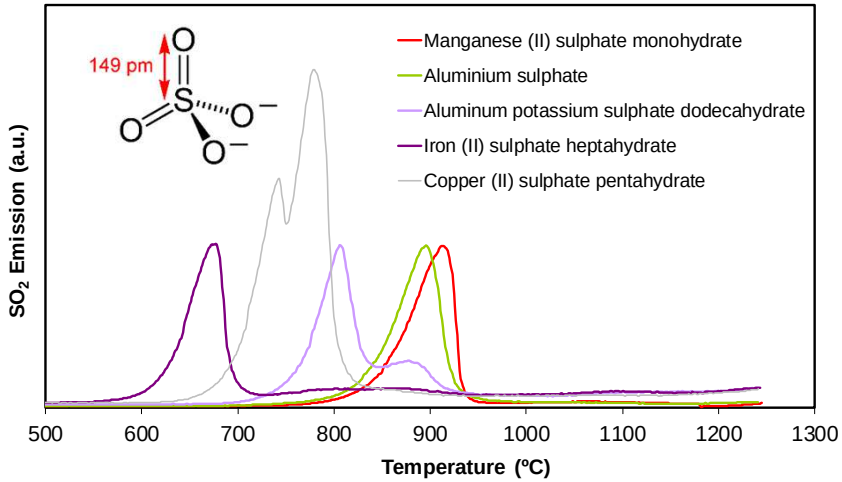
DSC-TG

QMS

Sulphides



Sulphates



WP5: SPECIATION MINERALS HARFMUL FOR HUMAN HEALTH

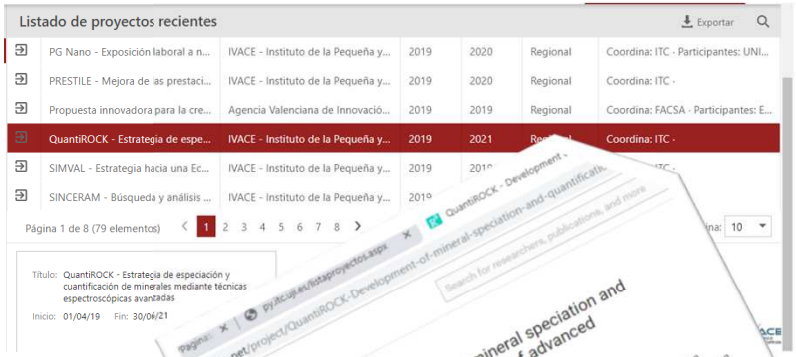
SWeRF determination

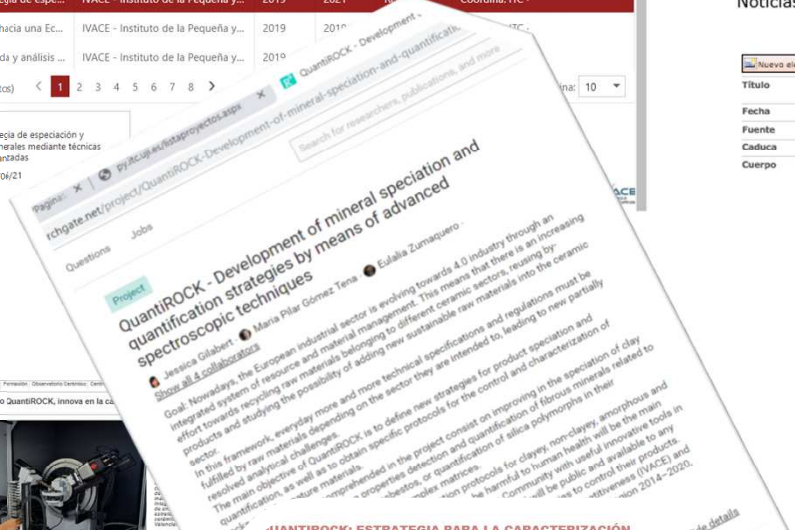
Limit of quantification <0.1%

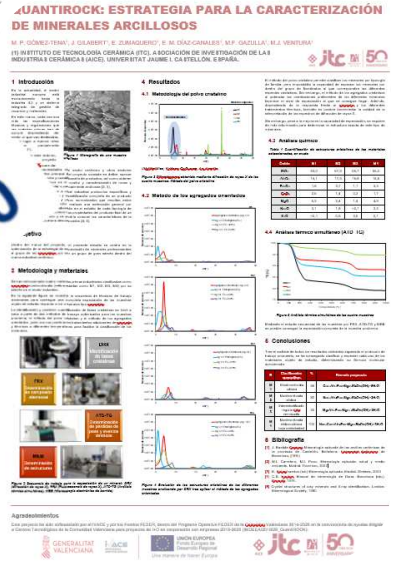
Asbestos determination

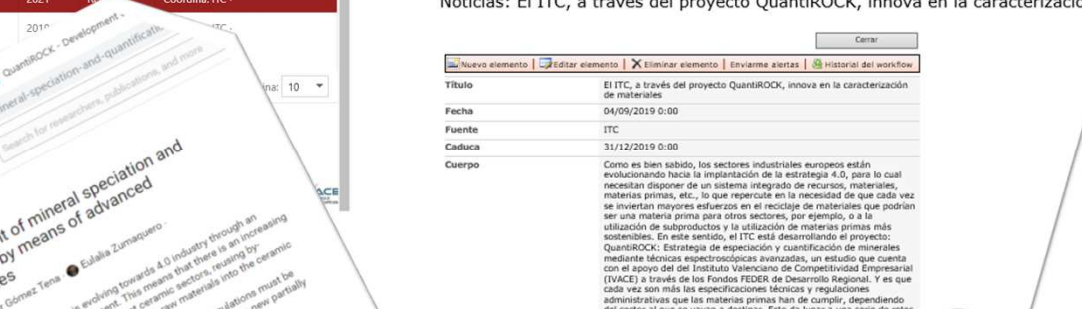
Limit of quantification <0.5%

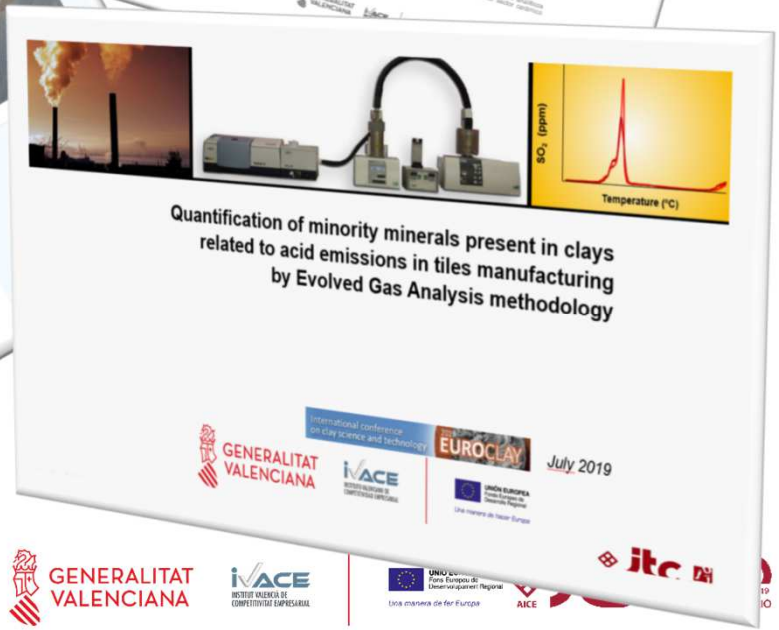
WP6: DIFFUSION ACTIONS





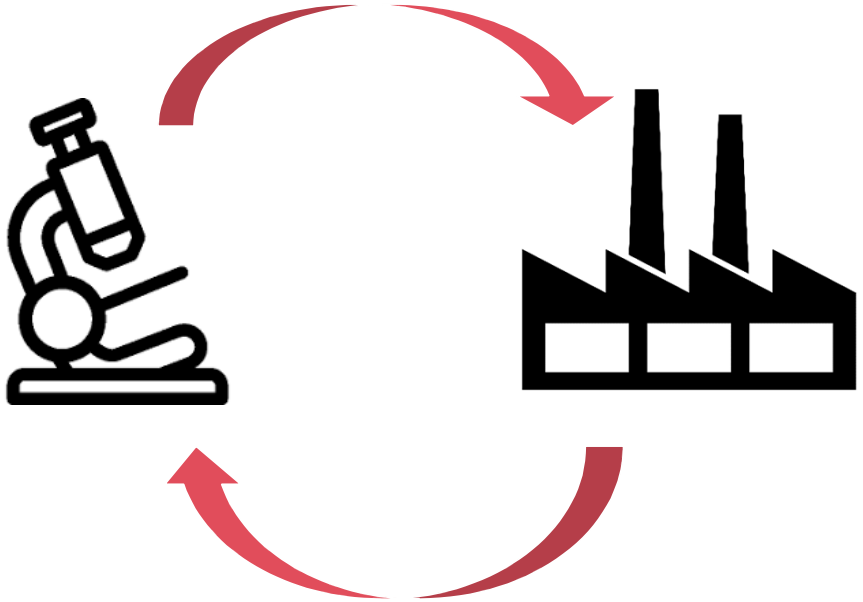






WP7: TECHNOLOGY TRANSFER

Companies which cooperate **GENERATING KNOWLEDGE**, from the beginning to the end of the project



Companies which participate **VALUATING RESULTS** obtained during the project

EUROARCE_SAMCA
ARCIBLANSA
QUIMIALMEL

AGC FLAT GLASS IBÉRICA

Cerámica Innova
Valencia (Spain) 3rd to 7th February 2020

7th Technology - Business Networking Event

Habitat, construction, architecture and ceramics sector

THANK YOU

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