

Project code: 2022-1-IT02-KA171-HED-000073309

Name and Surname: Jhonnathan Sieber

Home Institution: Universidad Central de Venezuela (UCV)

Host Institution: University of Camerino (UNICAM)

Type of mobility: Student mobility for studies (SMS)

Duration: 6 months

Description of the activities:

Based on my personal experience, the Erasmus mobility period is mainly based on activities for academic growth, however, it also has an intrinsic connection with experiences that go beyond the study to obtain an integral enrichment at a cultural, recreational, and even personal growth level.

When I arrived in Camerino, I had the pleasure of meeting students of different nationalities (Italian, Polish, Kazakh, Colombian, Argentinean...), who became my companions and friends with whom I had the opportunity to learn, have fun, and share different experiences.

To describe a synthesis of my activities during this period is demarcated by two aspects that allowed me to make the most of my 6 months as an Erasmus student at the University of Camerino: Academic and Cultural/Recreational.

Actividades Académicas

-Final Degree Project- Experimental Study of Crystal Mush Remobilization through Partial Melting.

Understanding mineral resorption rates in magmatic reservoirs has important implications for the rheology and eruptability potentials of stored magma. However, studying these processes represents a challenge in complex multi-component systems such as magmatic reservoirs due to non-equilibrium conditions between magma and partially melted crystals where heat (convection) and mass (diffusion and interphase reactions) transfer are perceived with fluid saturation phenomena such as H₂O. This study presents results of experiments that simulate the dissolution of alkali feldspar in trachytic magmas at water saturation conditions using syenitic rocks from the Breccia Museo (BM) unit within the magmatic system of the Phlegraean Fields (see **Figure 1**). First experiments were performed in the Ambient Pressure High Temperature Furnace (APHTF) (see **Figure 2.A**) at 1050 °C and 1100 °C at ambient pressure by 365h and 132h, respectively, using just the syenite sample without interaction with melt. The last experiment was performed in a Cold Seal Pressure Vessel (CSPV) (see **Figure 2.B**) at 850°C and 100MPa by 96.5h, where the syenite was in contact with trachytic melt. The experimental products were characterized using the Electron Microprobe Analyzer (EMPA) (see **Figure 2.C**). The main results are: 1) resorption textures like embayments (see **Figure 4**) observed in the experiment at 850°C and 100MPa where alkali feldspar crystals were in contact with the melt and, instead, when there was not melt interaction, glass filaments were observed as resorption textures within the crystals contact zones with alkali feldspar (see **Figure 3**); 2) glass composition is a hybrid between alkali feldspar and plagioclase composition (see **Table 1**); 3) The resorption rates were calculated at an average of $0.5 \frac{\mu\text{m}}{\text{h}}$, which means that reaching the equilibrium conditions within the magmatic reservoir could take months to years. These results have important implications for understanding the magma dynamic in trachytic systems.

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Figure 1 Map of Procida Island (Naples, Italy) showing the sampling point in Punta della Lingua (418671 N, 4513086 E).



Figure 2 A) APHTF at the Geology Division (UNICAM); B) CSPV at the Geology Division (UNICAM); C) EMPA at the UNIFI.

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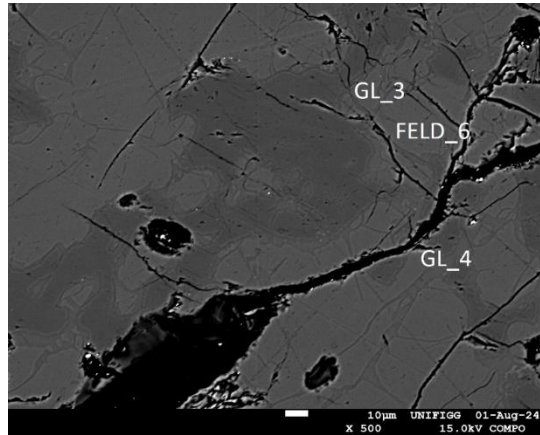


Figure 3 Ambient pressure experiments. Resorption textural filaments are observed in the contact zone between plagioclase and alkali feldspar.

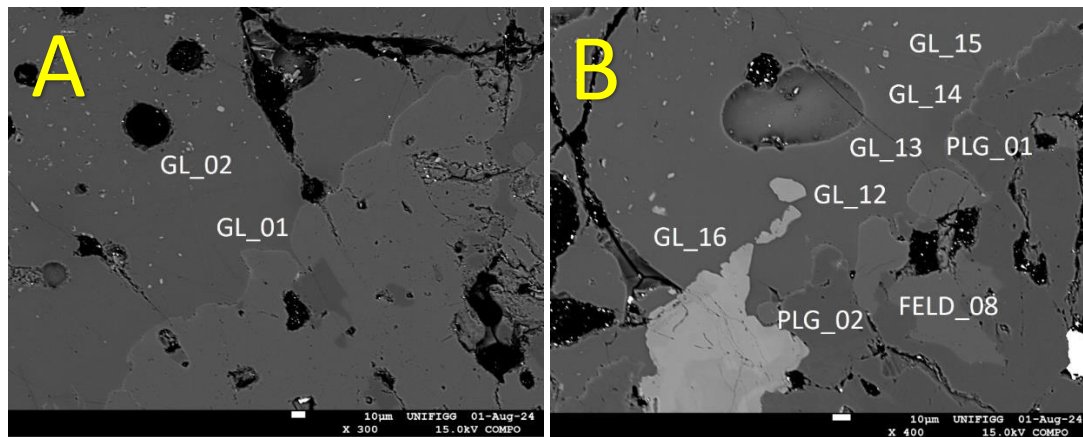


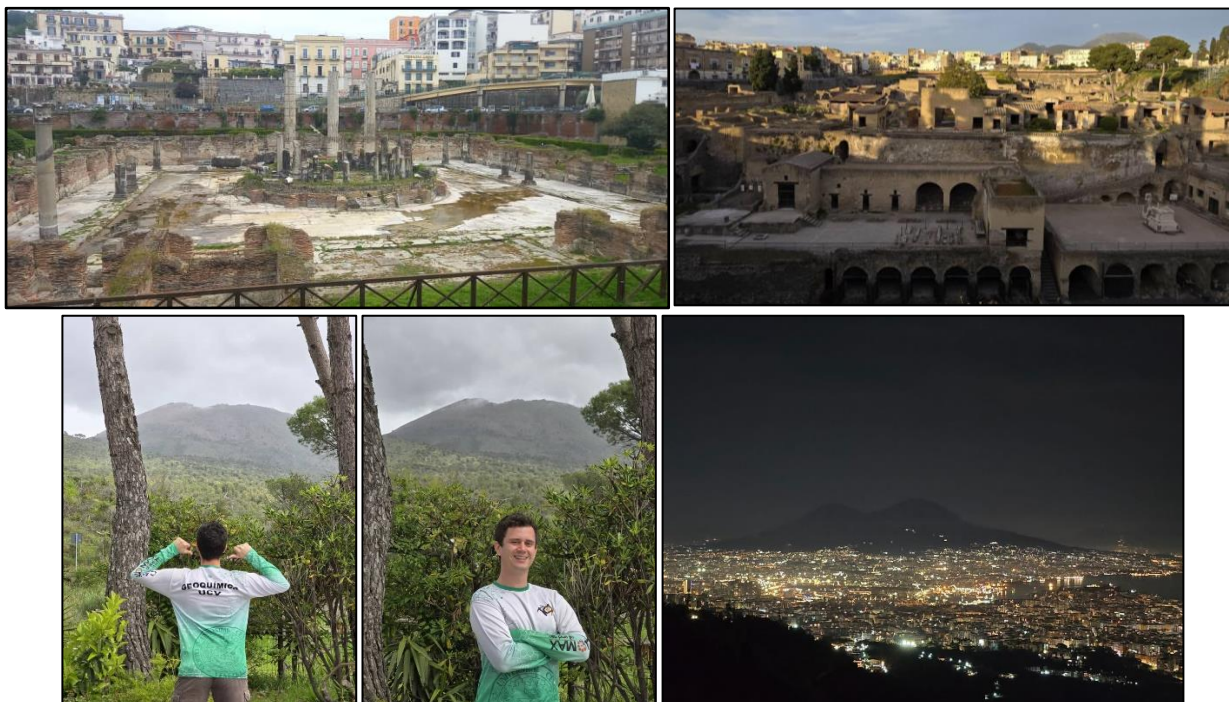
Figure 4 High-pressure experiments. Resorption textural embayments are observed in the contact zone between: **A)** alkali feldspar and the glass; **B)** clinopyroxene and the glass.

Table 1 Experimental data recollected with EMPA in the S1_2 running.

Phase	SiO ₂ (Mass%)	TiO ₂ (Mass%)	Al ₂ O ₃ (Mass%)	FeO (Mass%)	MnO (Mass%)	MgO (Mass%)	CaO (Mass%)	Na ₂ O (Mass%)	K ₂ O (Mass%)	SrO (Mass%)	BaO (Mass%)	Cl (Mass%)	F (Mass%)	Total (Mass%)
Alkali Feldspar	65.817	0.042	19.198	0.133	0.007	0	0.379	3.615	11.307	0.07	0.087	0.006	0	100.661
	65.763	0.02	19.267	0.118	0	0.002	0.342	3.636	11.25	0.062	0.156	0.005	0	100.621
	65.815	0.053	19.253	0.088	0	0.006	0.419	3.81	11.107	0.065	0.048	0.006	0	100.67
	66.115	0.023	19.16	0.132	0	0.005	0.415	3.57	11.208	0.046	0.094	0.013	0	100.781
	65.57	0.034	18.886	0.049	0	0.008	0.236	3.641	11.198	0.007	0.01	0.009	0.071	99.719
	65.331	0	18.927	0.163	0.008	0	0.322	3.822	10.998	0	0.013	0.008	0.064	99.656
Glass	61.67	0.045	23.723	0.208	0.013	0.004	5.038	6.033	4.147	0.068	0.078	0.019	0	101.046
	61.184	0	23.385	0.227	0	0	4.968	6.118	4.059	0	0.007	0.012	0.067	100.027
	60.972	0.004	23.864	0.235	0	0	5.376	6.237	3.64	0	0.019	0.057	0.076	100.48
Plagioclase	59.125	0.054	26.213	0.258	0.008	0.009	7.528	6.853	0.875	0.034	0.049	0	0	101.006

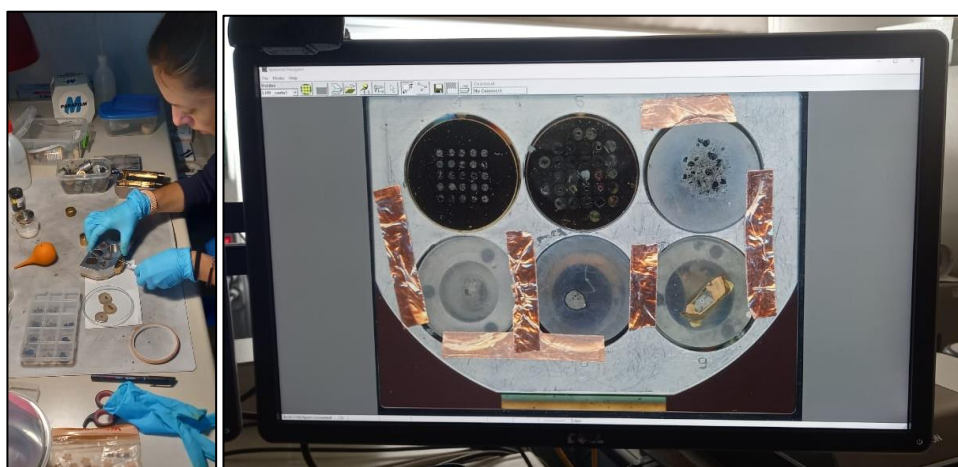
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-Field trip to Naples with Researcher Fabio Arzilli of the Geology Division of the University of Camerino (Il fume di lava -Vesuvio, Herculaneum Archaeological Park, Temple of Serapis, Monte Nuovo).



-Italian Course Level A2 taught by the Cambridge Center of UNICAM with Professor Stefano Bonfili

-Quantitative analysis to determinate the chemical composition of the final degree work experimental products using the Electron Microprobe Analyzer (EMPA) of the University of Florence (UNIFI).



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-Attendance by receiving a student grant to the SGI-SIMP Joint Congress 2024 in Bari (Italy) to present a poster on the final degree work focused on “The student's final work”.



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Alkali feldspar dissolution kinetics in trachytic melts

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Introduction

Understanding mineral resorption rates in magmatic reservoirs has important implications for the rheology and eruptability potentials of stored magma. However, studying these processes represents a challenge in complex multi-component systems such as magmatic reservoirs due to non-equilibrium conditions between magma and partially melted crystals where heat (convection) and mass (diffusion and interphase reactions) transfer are perceived with fluid saturation phenomena such as H₂O^{[1][4]}. This study presents results about experiments which simulate the dissolution of alkali feldspar in trachytic magmas at water saturation conditions using syenitic rocks. First experiments were performed in the Ambient Pressure High Temperature Furnace (APHTF) at 1050 °C and 1100 °C at ambient pressure by 365h and 132h, respectively, using just the syenite sample without interaction with melt. The last experiment was performed in a Cold Seal Pressure Vessel (CSPV) at 850°C and 100MPa by 96.5h, where the syenite was in contact with trachytic melt. The main results are: 1) resorption textures like embayments observed in the experiment at 850°C and 100MPa where alkali feldspar crystals were in contact with the melt and, instead, when there was no melt interaction, glass filaments were observed as resorption textures within the crystals contact zones with alkali feldspar; 2) glass composition is a hybrid between alkali feldspar and plagioclase composition. The results have important implications for understanding the magma dynamic in trachytic systems.

Materials and Methods

Starting Materials

The starting materials used for the alkali feldspar dissolution kinetics experiments are syenites samples composed predominantly of alkali feldspar from the Breccia Museo (BM) unit within the magmatic system of the Phlegraean Fields (PF)^[3]. Moreover, trachytic obsidian powder (ZAC) derived from the basement of the BM unit was used due to its compositional similarity regarding the syenitic rocks to promote solubility, kinetics, and heat transfer^[2].

Figure N° 1 Map of Procida Island (Naples, Italy) showing the sampling point in Punta della Lingua (418671 N, 4513086 E).

Experimental and Analytical Procedure

Ambient Pressure High Temperature Furnace (Lenton) (APHTF)

Ambient Pressure Experiments
1st Running: 1050 °C / 0.1MPa / 365h
2nd Running: 1100 °C / 0.1MPa / 132h

Cold Seal Pressure Vessel (CSPV)

High-Pressure Experiments
3rd Running: 850 °C / 100MPa / 96.5h

Electron Microprobe Analyzer (EMPA)

Chemical Composition Analysis of the Phases

Figure N° 2 A) APHTF at the Geology Division (UNICAM); B) CSPV at the Geology Division (UNICAM); C) EMPA at the UNIFI.

Preliminary Results

Ambient Pressure Experiments

Figure N° 4 Resorption textural filaments are observed in the contact zone between plagioclase and alkali feldspar. The composition of these phases are shown in the Table N° 1.

High-Pressure Experiments

Embayments texture is perceived in the experiments when the syenite is in contact with the melt.

Figure N° 6 Resorption textural embayments are observed in the contact zone between alkali feldspar and the glass.

Figure N° 7 Resorption textural embayments and clinopyroxene resorption in contact with trachytic glass.

Table N° 1 Experimental data recollectored with EMPA in the S1_2 running.

Phase	SiO ₂ (Mass%)	TiO ₂ (Mass%)	Al ₂ O ₃ (Mass%)	FeO (Mass%)	MnO (Mass%)	MgO (Mass%)	CaO (Mass%)	Na ₂ O (Mass%)	K ₂ O (Mass%)	SrO (Mass%)	BaO (Mass%)	Cl (Mass%)	F (Mass%)	Total (Mass%)
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Plagioclase	59.125	0.054	26.213	0.258	0.008	0.009	7.528	6.853	0.875	0.034	0.049	0	0	101.006

Figure N° 5 Diagram K₂O vs CaO using the S1_2 EMPA data.

The resorption rates were calculated at an average of 0.5 $\frac{mm}{h}$. It means that reaching the equilibrium conditions within the magmatic reservoir could take months to years.

Jhonnathan Sieber

Amministrazione

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Cultural/Recreational Activities

-Participation in activities related to the Corsa alla Spada e Palio festival in Camerino. Dressing as Squire for the Parade.

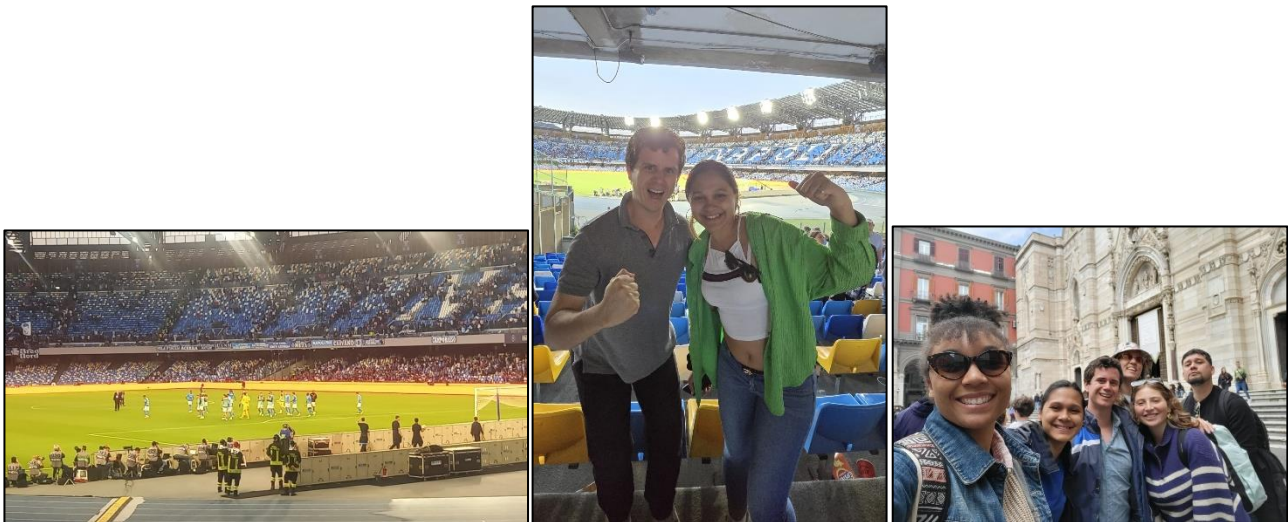


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-Camping in Fiastra Lake

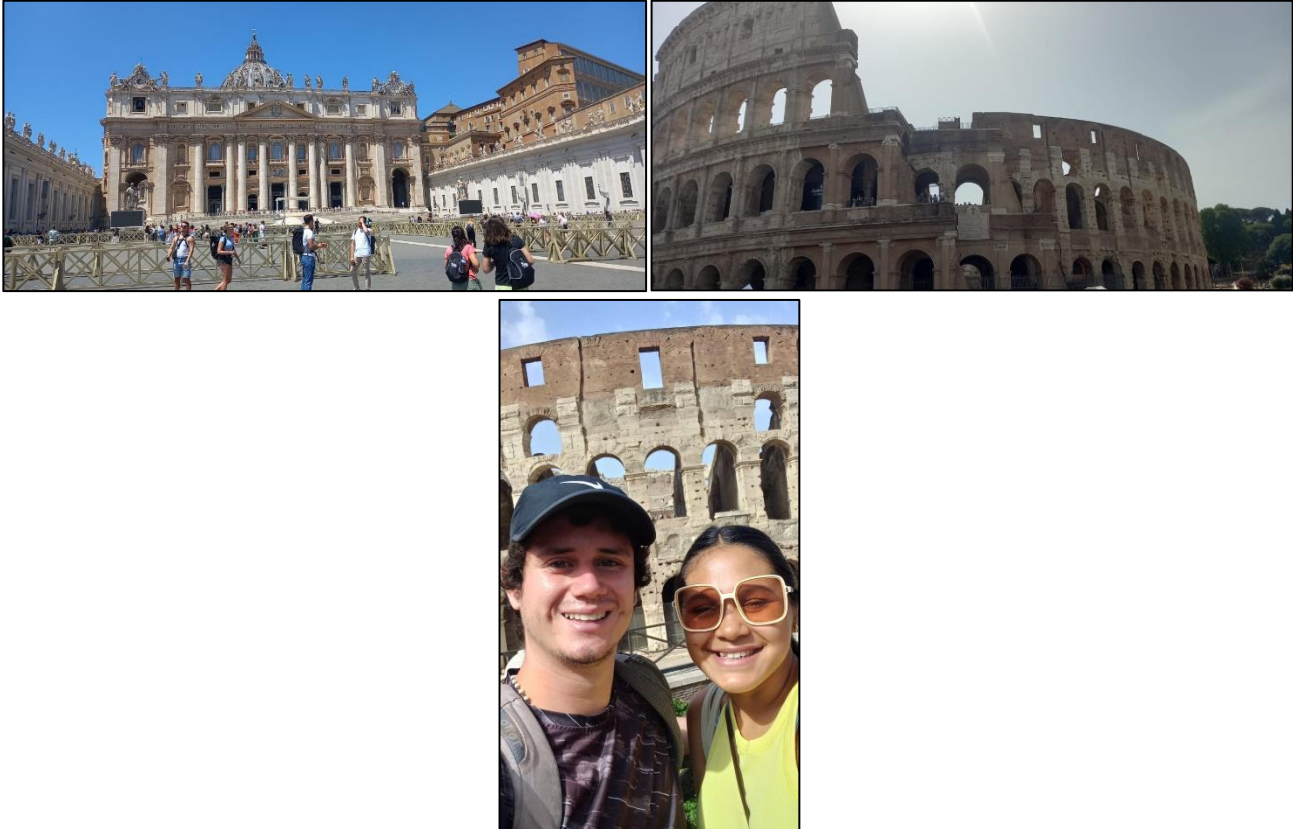


-Naples Trip



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-Roma Trip



This compendium of activities allowed me to grow up as a young geoscientist but also allowed me to forge links with new people and with the inhabitants of Camerino, which made me feel like another member of the *Camerse* community. Of course, I was also fortunate to have the support of people like Prof. Miller Zambrano, Researcher Fabio Arzilli, PhD Abel Zaragoza, and Dr. Sara Rossini who made this process much more comfortable...

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If I had to define my Erasmus experience in one sentence, it would be... “a blissful before and after in my path to success”.

