



## DELIVERABLE D3.3

# Thermodynamic modelling of phase equilibria

**Lead Beneficiary:** UNIPD

**Authors:** P. Slupski<sup>1</sup>, A. Galgaro<sup>1</sup>, R. Sassi<sup>1</sup>,

**Authors affiliations:** <sup>1</sup>UNIPD

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## ABBREVIATIONS AND GLOSSARY OF ACRONYMS

| Acronym        | Extended definition                               |
|----------------|---------------------------------------------------|
| BSE            | Backscattered electron                            |
| DG             | Department of Geosciences                         |
| DLT            | Discrete Laser Tests                              |
| EDS            | Energy Dispersive Spectroscopy                    |
| FEG            | Field emission gun                                |
| IR             | Infrared                                          |
| LLT            | Linear Laser Tests                                |
| OM             | Optical microscopy                                |
| PPL            | Plane polarized light                             |
| ROP            | Rate of Penetration                               |
| SE             | Secondary electron                                |
| SEM            | Scanning Electron Microscopy                      |
| SR             | Red sandstone                                     |
| SY             | Yellow sandstone                                  |
| TCS            | Thermal Conductivity Scanner                      |
| UNIPD          | University of Padua                               |
| WD             | Working distance                                  |
| XPL            | Crossed polarized light                           |
| XRD            | X-Ray Diffraction                                 |
| XRF            | X-Ray Fluorescence                                |
| Symbol         | Definition                                        |
| P              | power (kW)                                        |
| $\rho$         | density (g/cm <sup>3</sup> )                      |
| P <sub>p</sub> | power density (W/cm <sup>3</sup> )                |
| E              | Young's Modulus (GPa)                             |
| Ab             | water absorbance (%)                              |
| V <sub>p</sub> | P-wave velocity (km/s)                            |
| V <sub>s</sub> | S-wave velocity (km/s)                            |
| $\nu$          | Poisson's ratio (-)                               |
| G              | shear modulus (GPa)                               |
| $\lambda$      | thermal conductivity (W/m·K)                      |
| C <sub>p</sub> | volumetric thermal capacity (J/m <sup>3</sup> ·K) |
| $\alpha$       | thermal diffusivity (m <sup>2</sup> /s)           |
| S <sub>E</sub> | specific energy (kJ/cm <sup>3</sup> )             |
| t <sub>i</sub> | time of irradiation (s)                           |
| T              | temperature (°C)                                  |
| T <sub>s</sub> | average temperature of spallation (°C)            |

## EXECUTIVE SUMMARY

This report focuses on the phase transition of the rock (solid-liquid-solid). Melting, quenching and formation of glass were investigated, and its mineral and chemical composition were characterised. During the laser experiments glass was obtained in situ (on borehole walls) and from the accumulation of thermally spalled particles that partially melted and coalesced. With the use of the data shown in deliverables D3.1 and D3.2 thermodynamic modelling was performed to estimate melting and quenching temperature at various conditions.

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