The thermal expansion of Ilmenite and Geikielite under lunar mantle conditions.

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Ilmenite ($FeTiO_3$) is considered a significant phase in the lunar interior, playing a crucial role in the crystallisation dynamics of the lunar magma ocean (LMO). While the exact abundance of ilmenite within the Moon remains a subject of debate, its importance is particularly pronounced during the final stages of LMO crystallisation. As the magma ocean evolves, it becomes increasingly enriched in iron (Fe) and titanium (Ti), with ilmenite being one of the last phases to crystallise [2]. Furthermore, ilmenite is likely the densest mineral to form in this process, making it a key driver in the potential late-stage overturn of the lunar mantle. This overturn mechanism could lead to the redistribution of dense material, possibly resulting in a stratified mantle with a high-density layer above the lunar core. Thus, understanding the physical properties of ilmenite under varying temperature and pressure conditions is essential for modelling the Moon's thermal and compositional evolution.

Performing thermal expansion on $MgTiO3$ (Geikielite) and $FeTiO3$ (Ilmenite) from 40k to 1200K is crucial to understanding the behaviour of the partial melt layer at the Moon's mantle-core boundary [1]. This research project analyses their volumetric thermal expansion, thereby providing key insights into the density distribution within the lunar melt layer and its impact on seismic wave propagation at the mantle-core boundary. This analysis will shed light on the buoyancy forces driving material sinking and upwelling, which are key factors in the evolution of the Moon's internal structure. This has significant implications for understanding mantle overturn dynamics and the long-term thermal evolution of the lunar interior [1].

To achieve this, we employ a combination of in-situ synchrotron X-ray powder diffraction and first-principles calculations using the Vienna Ab initio Simulation Package (VASP). The X-ray diffraction experiments were conducted across a broad temperature range (40 K to 1200 K), covering diffraction angles (2θ) from 18° to 156°. These experimental data were then compared with density functional theory (DFT) calculations and with other studies, particularly the work of J. Song et al. (2017) [1].

These results will be combined with high pressure measurement to obtain the density and seismic velocities of this important phase and used to constrain the stability of any late forming layer and the likelihood of some sort of lunar overturn, enhancing our understanding of the Lunar's geological history and internal structure.

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You spin me round – Exchange-driven reorientation of magnetic states in magnetite by chiral molecules and (potential) implications for the origin of life

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The origin of homochirality – the preference for one of the two mirror-image (or enantiomer) versions of chiral biological molecules – remains a pivotal question in understanding the emergence of life. Homochirality is fundamental to life's chemistry: RNA exclusively contains right-handed D-ribose, proteins are composed of left-handed L-amino acids, and metabolites adopt specific chiral configurations. Recent studies revealed that enantiomeric selectivity in ribose-aminooxazoline (RAO) – a key RNA precursor – can be induced and propagated through interactions with magnetized materials. Spin alignment biases, linked to remanent magnetization in natural materials like magnetite, serve as effective symmetry-breaking agents for enantioselective molecular formation. Experiments demonstrate that RAO crystallizes with high chiral selectivity on magnetized multi-domain (MD) magnetite thin films. Once homochirality is achieved, it can induce domain transformation, creating a uniform surface magnetization, which spreads across the magnetic surface akin to an avalanche. However, early Earth conditions were certainly distinct to those achieved in the laboratory; in evaporative lake settings, magnetite formation likely involved authigenic precipitation, leading to individual and/or cluster of nanoparticles (NP) in the single-domain (SD) and pseudo-single-domain (PSD) range. It remains to be seen, therefore, if domain transformation on SP, SD and PSD magnetite grains takes place in the presence of homochiral crystals, akin to the magnetization avalanche observed in MD thin films. To explore this, we developed a phenomenological model coupling micromagnetics, machine-learning and analytical models to examine how homochiral crystals drive magnetization changes in SP and SD magnetite. Our model quantitatively predicts coercivity and thermal stability changes in magnetite NPs due to exchange interactions, offering insights into feedback mechanisms critical for propagating homochirality in prebiotic systems and its potential role in the origin of life's homochirality.

Compositional insights into Fe/Ti oxide exsolution achieved through tom Probe Tomography

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The nanoscale composition and exsolution behaviour of iron oxides have critical implications for understanding paleomagnetic signals and the thermochemical history of volcanic systems [1]. In this study, we employ Atom Probe Tomography (APT) [2] and Transmission Electron Microscopy (TEM) to investigate the nanoscale features of exsolved iron oxides within a volcanic basalt sample. Our work focuses on an intergrowth of ilmenite, titanohematite, and rutile, providing atomic scale 3D compositional maps and insights into the exsolution processes at the nanoscale.

Through APT, we precisely mapped the exsolution boundaries and quantified the compositional transition distances between titanohematite/ilmenite and rutile, shedding light on the nanoscale mechanisms governing phase separation. TEM analyses further complement these findings, offering structural and morphological context to the nanoscale chemical variations. Preliminary results reveal distinct exsolution zones, with well-defined compositional gradients and interfacial features.

While the study currently centres on ilmenite-titanohematite-rutile systems, ongoing work aims to incorporate additional data from a magnetite-ilmenite assemblage, which will enhance our understanding of the broader mineralogical and magnetic implications.

These findings provide new perspectives on the nanoscale architecture of exsolved iron oxides and offer a foundation for interpreting paleomagnetic data with greater accuracy. This work will be particularly relevant to researchers who may be less familiar with APT as a tool for resolving nanoscale compositions and phase relationships in geological samples.

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Stishovite behaviour under cyclic loading using the dynamic diamond anvil cell

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Stishovite, a high-pressure polymorph of SiO_2, is expected to be present in the deep Earth, in particular in the crustal part of subducted slabs. It has also been proposed that SiO_2 can exsolve from Earth's core as it crystallizes, and/or that silica-rich regions have remained in the lower mantle after crystallization of the magma ocean. Determining stishovite properties at high pressures is hence crucial to interpret seismic signals from the mantle and understand geodynamic processes. Previous studies have determined the elastic properties of stishovite at high pressure and high temperature, but its response to an imposed oscillating pressure has not been investigated. In nature, though, seismic waves induce stress oscillations, imposing a cyclic stress loading to the rocks they pass through.

Here, we employed the dynamic diamond anvil cell (dDAC) to mimic in the laboratory the stress oscillations that a seismic wave can produce in a rock. A sintered polycrystalline stishovite sample was first pressured manually up to 40 GPa. Using the dDAC setup available at the P02.2 beamline at PETRA III (DESY), we then applied loadings by sending a cyclic signal to the piezoactuator controlling the compression of the dDAC. Every second during the loading, an X-ray diffraction pattern of the sample was acquired in radial scattering geometry to monitor in-situ the symmetry, shape, and volume of the unit cell as well as lattice strains and preferred orientation in the sample. We will discuss the relevance of our results for the interpretation of seismic data and geodynamic modelling.

Resolving the Internal Magnetic Structure of Tetrataenite

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Tetrataenite (γ''-FeNi) is an ordered, bct iron-nickel alloy that occurs naturally only in meteorites. Its high magnetocrystalline anisotropy leads to microcoercivities on the order of 1 T, making it attractive for: 1) paleomagnetic studies of meteorites that rely on the existence of ferromagnetic materials that can retain stable magnetic records over the lifetime of the solar system; and 2) material scientists searching for a replacement for environmentally-damaging rare-earth element magnets that are ubiquitous in modern appliances and technology. In the past decade, advances have been made in both subfields with the detection of planetesimal magnetic dynamos on iron-meteorite parent bodies [1] and the successful synthesis of minor quantities of tetrataenite in a laboratory setting [2]. However, a fundamental necessity to further advances in both areas of research is a greater understanding of the magnetic domain structure of tetrataenite as previous paleomagnetic studies have assumed single domain tetrataenite and the utilization of industrial tetrataenite will depend on creating grains with certain magnetic properties.

Here, we focus on the application of tetrataenite domains to meteoritical paleomagnetic analyses. Tetrataenite often occurs in meteorites in the "cloudy zone," a microstructure consisting of nanoscale, densely packed tetrataenite islands in a Fe-enriched matrix (Figure 1a). The close-packed nature of the islands leads to strong magnetostatic interactions, which may both help and hinder cloudy zone tetrataenite as a viable paleomagnetic recorder since: 1) micromagnetic modelling indicates that interactions may allow for an increase in the size of the single domain stability field through the destruction of domain walls [3, 4], but 2) prevents the determination of paleointensities of ancient magnetic fields as paleointensity theory is often based on non-interacting grains. However, we have been unable to test the micromagnetic theory and quantify the effect of magnetostatic interactions between tetrataenite grains due to our inability to image the magnetic structure of individual islands.

Here, we present the initial results of ongoing work applying X-ray pytchotomography (XPT) [5] to a cloudy zone in the Esquel pallasite meteorite. This novel synchrotron-based technique allows for magnetic contrast imaging down to 4-5 nm resolution, an order of magnitude better than previous techniques such as X-ray photoemission electron microscopy and X-ray holography (~40 nm). Our two-dimensional images of Esquel tetrataenite (average island size ~150 nm, expected to be two-domain) completely resolve the internal magnetic structure of the islands for the first time and show the presence of both single-domain and two-domain tetrataenite (Fig. 1b,c). This result validates the above micromagnetic modelling and emphasizes the importance of interactions in creating large, single-domain tetrataenite grains. Future work will involve additional XPT reconstructions to create three-dimensional magnetic renderings of cloudy zone magnetization and the incorporation of these results as a test case for a model that explores the relationship between ancient paleointensity and cloudy zone magnetic expression.

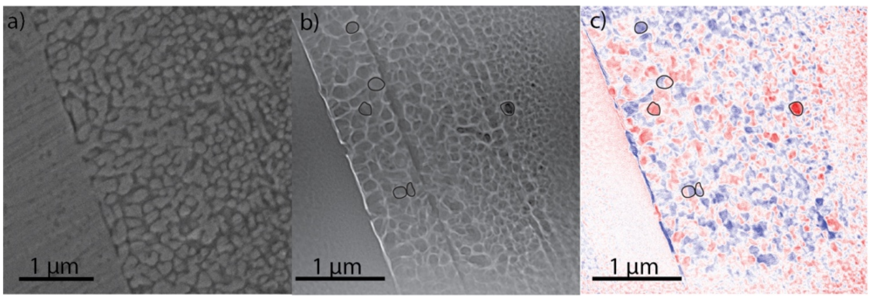

Figure 1. a) Secondary electron image of cloudy zone in Esquel pallasite. b) Phase sum XPT image of cloudy zone, black borders are example grain boundaries. c) Phase contrast XPT image of b)

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Melting Line Measurements using X-ray Phase Contrast Imaging

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Measurements of the melting temperature of opaque materials under static high pressure are a key property to understand planetary interiors. However, for many geo-physically relevant materials large discrepancies in the presented melt curves (depending on the experimental approach) exist, with iron being the most prominent example [1-3]. Techniques to detect melting include detection of flickering of the optically imaged hot spot, the laser speckle technique for observation of movement, X-ray transmission microscopy, laser power-temperature plateaus, diffuse X-ray scattering from the melt, changes in resistivity and reflectivity, flash laser-heating combined with scanning electron microscopy and/or focused ion beam milling, X-ray absorption spectroscopy, Mossbauer spectroscopy, and detection of latent heat [5].

As a novel approach, we present time-resolved synchrotron X-ray phase contrast imaging [5] to directly observe the solid-liquid and solid-solid phase transition in laser heated samples in the diamond anvil cell along with simultaneous X-ray diffraction and optical radiometric temperature measurements. This technique was benchmarked with experiments on the uncontroversial high-pressure melting of platinum [4], and used on a variety of other samples from simple metals (Bi, Sb, Sn, Pb) to geologically relevant materials such as Olivine.

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Study of high pressure properties of geomaterials using time-resolved diagnostics

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Free Electron Lasers represent a cutting-edge generation of large-scale facilities, generating exceptionally brilliant X-ray pulses. These pulses can be coupled with Diamond Anvil Cells (DACs) or High-Power Lasers to conduct time-resolved studies of materials under extreme conditions. Moreover, the ESRF-EBS introduces a novel high brilliance beam, enabling innovative time-resolved methodologies.

Shock compression achieves high pressure-temperature (P-T) conditions but only for a few nanoseconds. Utilizing short X-ray pulses of a few femtoseconds enables the probing of highly homogeneous samples under extreme conditions. I will present our recent research on Fe spin state measurements in liquid olivine, as well as the liquid structure of MgSiO3 exceeding 200 GPa or liquid Fe and Fe alloys at 200 GPa.

Furthermore, the MHz to kHz frequency range of the X-ray beam now permits tracking phenomena occurring in DACs at microsecond timescales. Coupling this high repetition rate with pulsed lasers enables the tracking of melting relations in the cell for homogeneous samples before chemical migration ensues. I will discuss partial melting of Fe alloys, and also recent advancements in X-ray heating of Fe, which allows for the deduction of phase diagrams and thermal conductivity when combined with in situ measurements and Finite Element Modeling.

High pressure and temperature viscometry from optical and X-Ray imaging of particle motions in the Laser Heated Diamond Anvil Cell

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Diamond Anvil Cells (DACs) have revolutionized the study of matter under extreme conditions, offering unparalleled opportunities to explore the behaviour of materials at high pressures. When combined with laser heating techniques, a technique called Laser Heated Diamond Anvil Cells (LHDAC), researchers can investigate matter at elevated temperatures, enabling the study of melt flow phenomena crucial for understanding fluid behaviour in planetary interiors.

While experimental observations provide valuable insights into flow patterns and melt velocities under these extreme conditions, the underlying dynamics of fluid flow remain insufficiently understood. By developing fluid dynamic models that accurately replicate the flow dynamics within the cell, along with corresponding flow patterns and velocities, we can extract melt transport properties such as viscosity.

In this study, we utilize the LHDAC technique alongside advanced imaging methods, including optical and X-ray imaging performed at synchrotron and free electron laser facilities, to track the motion of particles suspended in melt. By combining these observations with fluid flow modelling techniques, we extract the viscosity of melts under the extreme pressures and temperatures that exist in planetary interiors.

X-ray tomography of geological materials at extreme conditions

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The structure and composition of the Earth's deep interior cannot be directly measured, but instead must be inferred from indirect geophysical observations, predominantly the interpretation of seismic velocity data. This approach relies on the availability of high-quality data for the seismic properties of all the potential deep Earth minerals, fluids and melts. Despite their importance for understanding the basic properties of the deep Earth, there are very few measurements of seismic properties for minerals or melts at the pressure and temperature conditions of the deep Earth. Currently, instead of using data, we rely on large extrapolations of low pressure and temperature data or on theoretical estimates.

My PhD project aims to extend recently developed techniques at UCL for performing lab-based measurements of the physical properties of Earth at high pressure and temperature conditions. In these experiments high-pressure samples contained within a Paris-Edinburgh press are imaged using X-rays to observe changes in their internal structure. By collecting multiple X-ray radiographs as the sample is rotated, a micro-resolution 3-dimensional tomogram of the sample's internal structure may be generated. Measurements can be performed at upper mantle conditions extending to ~ 10 GPa and > 1200 K, which makes the scope for this technique extremely broad and exciting.

Towards a Quantitative Assessment of the Impact of Transient Mantle Rheology on Future Ice-Sheet Stability

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Mass transfer between the cryosphere and oceans leads to sea-surface height and topography changes whose timescales, amplitudes, and spatial patterns are controlled by mantle viscoelasticity. This '*glacial isostatic adjustment'* (GIA) can slow or halt retreat of unstable marine-based ice sheets since ice loss induces gravitational sea-surface lowering and bedrock rebound, reducing water depths around ice-sheet margins and lowering exposure to melting by warm ocean currents. Despite widespread recognition of this solid Earth–ice-sheet feedback, it has often been assumed that Earth's mantle is too viscous for this behaviour to have a measurable impact on ice-sheet dynamics over decadal to centennial timescales. As a result, many ice-sheet models in state-of-the-art intercomparisons therefore assume a rigid bed or multicentennial to millennial deglacial bedrock rebound timescales.

However, GPS timeseries of bedrock displacement suggest very low mantle viscosities exist beneath vulnerable regions of the Greenland and West Antarctic Ice Sheets (~10^{17}–10^{19} Pa s), implying stress relaxation timescales of years to decades. These new observations are leading to a paradigm shift in cryospheric modelling as it is becoming increasingly clear that viscoelastic solid Earth deformation is sufficiently rapid to significantly impact ice-sheet stability on the timescales of anthropogenic climate change. State-of-the-art coupled ice-sheet–sea-level models that incorporate 3D mantle viscosity variations find that rapid bedrock deformation could lower future Antarctic sea-level contributions by ~40% over the next two centuries and could generate ±20% differences in ice-sheet basal melt through its impact on shelf depth and warm water flux to the grounding line. The relative size of these effects is already comparable to varying climate forcing and bed topography within their projected uncertainties; however, they still do not account for transient rheological behaviour (i.e., the loading timescale dependence of effective viscosity). There is now strong evidence that transient stress relaxation processes are operating in the mantle since calibrated experimental parameterisations of these mechanisms successfully reconcile previously conflicting mantle viscosity estimates obtained in the same location, but for deglaciation signals with differing characteristic timescales. This transient deformation may significantly stabilise marine-based ice sheets on human timescales. For example, it appears, based on preliminary results, that this behaviour can produce bedrock rebound in response to decadal-to-centennial ice loss that is at least ~70% faster than expected for 'steady-state' behaviour, helping to reduce ice margin exposure to warm seawater. Despite its likely importance, the impact of this rheological behaviour on future ice-sheet dynamics and sea-level change remains unknown and unexplored.

A new theoretical and computational infrastructure for predicting transient rheological impacts on future ice-sheet stability is needed that is both rigorously validated against seismic, geodynamic, and geodetic data and efficient enough to enable uncertainty quantification. We propose to make this breakthrough by developing a fast, flexible, and scalable numerical framework to formulate and solve the relevant constitutive equations. This new scheme will allow any arbitrary parameterisation of transient rheology—and its dependence on mantle state—to be accurately incorporated into coupled 3D GIA–ice sheet simulations with minimal extra computational cost, including whichever Earth models optimise fit to RSL data. The resulting predictions of future solid Earth, ice-sheet, and sea-level evolution will account for transient creep, while also producing steady-state behaviour that agrees with independent constraints on past mantle dynamics. Importantly, these models will allow self-consistent calculation of Earth deformation on day-to-megayear timescales, advancing knowledge of other controversial phenomena, e.g., post-seismic relaxation and body tides.

Melting phase relations in the system Fe-S-O under high pressure and the Martian core composition

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Abstract

Identifying impurity elements dissolved in the central metallic core is the key to understanding the origin and evolution of terrestrial planets. The core of Earth has been widely studied through seismic and geo- and cosmochemical investigations and its dynamics to generate magnetic fields have been extensively discussed in relation to crystallisation of dissolved light elements such as silicon and oxygen. In light of NASA's InSight mission, seismological constraints have since been placed on the interior of Mars, namely, the core radius has been measured which gave rise to a core mean density. Results showed that the core is primarily liquid with a significant amount of light elements present, 9-15%. In this study, we try to establish a feasible compositional range for the Martian core in the well accepted system Fe-S-O, based on geodetic information such as the absence of intrinsic magnetic fields in Mars.

Sulphur and oxygen are widely accepted as promising candidates for main constituent light elements in the Martian core. Melting relations of the Fe-O-S system have been studied in multianvil apparatus up to $\sim$27 GPa [Tsuno and Ohtani, 2008] which is corresponding to the top of liquid core. However, the phase relations at the bottom of the core $>$40 GPa, have not been examined, although those at pressures greater than 50 GPa were reported from a diamond anvil cell (DAC) study [Yokoo et al., 2019].

In this study, we have investigated the liquidus phase relations of the Fe-O-S system up to 60 GPa using laser-heated DAC experiments with *in-situ* X-ray diffraction at the Petra III synchrotron facility. Melting was defined through the disappearance of diffraction peaks from subsolidus phases. We will also present results of textural observations using the FIB-SEM system on recovered samples. We will then discuss the feasible compositional range in system Fe-S-O for the martian core.

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The iron spin crossover in ferropericlase and its seismic signal in the lower mantle

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The second most abundant mineral in a pyrolitic lower mantle is (Mg,Fe)O ferropericlase. At the pressure-temperature conditions of Earth's deep interior, iron atoms in ferropericlase undergo a change in electronic configuration. This gradual transition from high-spin (HS) to low-spin (LS) state is referred to as the spin crossover and leads to changes in a number of physical properties. The anomalously enhanced compressibility of ferropericlase in the pressure range where HS and LS iron coexist is of particular interest, because it has a direct effect on seismic velocities. Therefore, constraining the occurrence of the spin crossover in the lower mantle is important for the interpretation of seismic observations. This requires a detailed understanding of the elastic properties of ferropericlase across the spin crossover as a function of temperature and iron content, as well as characterizing the seismic signal of the spin crossover to allow for its detection in seismic observations.

I will show how temperature and iron content affect the spin crossover-induced bulk modulus softening of ferropericlase using continuous compression experiments in diamond-anvil cells, combined with time-resolved synchrotron X-ray diffraction. I will discuss the implications of these findings for the spin state of the lower mantle. In addition, I will demonstrate that the spin crossover has a characteristic expression in seismic tomography models and travel time data using synthetic velocity models of the lower mantle and wave propagation simulations. While this signal provides a tool for future mapping of the spin crossover in Earth's mantle, it also illustrates that it is essential to take the effects of the spin crossover on seismic velocities into consideration when inverting seismic observations for temperature and composition of the lower mantle.

Mild-to-wild plasticity of Earth's upper mantle

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The flow of Earth's upper mantle has long been considered to occur by slow and near-continuous creep. Such behaviour is observed in classical high-temperature deformation experiments and is a fundamental component of geodynamic models. However, the latest generation of high-resolution experiments, capable of sensing temporal heterogeneities in rates of dislocation motion, have revealed that materials ranging from metals to ice exhibit a spectrum of behaviours termed mild-to-wild plasticity. It remains unknown whether olivine, the most abundant mineral in Earth's upper mantle, always exhibits mild continuous flow or can exhibit intermittent wild fluctuations in plastic strain rate. Here, we demonstrate that olivine exhibits measurable wildness, even under conditions at which its behaviour is predicted to be relatively mild. During nanoindentation experiments conducted at room temperature, continuous plastic flow is punctuated by intermittent bursts of displacement with log-normally distributed magnitudes, indicating avalanches of correlated dislocation motion that account for approximately 8 ± 6% of the plastic strain. Remarkably, the framework of mild-to-wild plasticity predicts that wildness should increase with depth in Earth, with flow of the asthenospheric upper mantle occurring almost entirely by wild fluctuations of deformation at the grain scale. The recognition of intermittent plasticity in geological materials provides new constraints for microphysical models of dislocation-mediated flow and raises questions about the mechanisms of transient instabilities in otherwise ductile regimes, such as deep earthquakes and slow-slip events.

Crystal structure of superhydrate, sodium chloride tridecahydrate

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Water is a fundamental and ubiquitous substance which plays an important role in many aspects of geology, biology, and chemistry. One of its unique features is the structural variety of the crystalline polymorphs depending on the pressure and temperature. The structural diversity and complexity are enhanced in multi-component systems like saline solutions commonly seen in nature. From the solution, salt hydrates can crystallise instead of separating into anhydrous salt and pure water ice. As a result of the balance among various contributions such as the hydrogen bonds and electrostatic forces, salt hydrates also show compositional and structural variety under pressure (*e.g.* $MgCl_2 \cdot 10H_2O$ [1]). Such phase behaviour of salt-water systems is related to the transport and accumulation of ionic species [2]. Especially, the hydrates with a large hydration number are called superhydrates and their natural existence is prospected in icy bodies. Despite the importance, salt hydrates under pressure are not fully clarified even for simple inorganic salts.

To explore the high-pressure phase relation in the NaCl-water system, we performed *in-situ* diffraction experiments. Through the investigation, we found a tridecahydrate form ($NaCl \cdot 13H_2O$), a unique high-pressure phase in both composition and structure [3]. Its structure determination was not accomplished only from x-ray diffraction due to the low sensitivity to hydrogen and the complicated structure, neutron diffraction in combination with x-ray diffraction which is less sensitive to hydrogen. The crystal structure is clarified by single-crystal neutron diffraction owing to the recent development of specialised diamond anvil cells [4,5]. The obtained hydrogen-bonding structure is found to contain hydrogen disorder and also some similarities to the ice structure. The details of the unique structural features of this hydrate will be presented.

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We thank Dr. Ohhara and Dr. Munakata for their support for the neutron diffraction experiments. We are also grateful to Prof. Irifune, Dr. Shinmei, Prof. Sugiyama, and Prof. Kawamata for their contributions to the development of the diamond anvil cells for single-crystal neutron diffraction.

Thermal conductivity of Ferropericlase: from MgO to FeO endmembers.

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Large scale dynamics within the Earth are the result of its secular cooling. Heat is transported towards the surface by large scale convection and conduction processes that occur in the mantle, core and across the thermal boundary layers at the core–mantle boundary (CMB) and the lithosphere at different rates. Determination of thermophysical properties of lower mantle minerals, such as periclase and ferropericlase is important to understand the thermal history of the Earth[1-3]. There is a range of estimates for these thermal transport properties such as thermal conductivity (k) in the lower mantle which ranges between 4 and 16 W/(m K)[4-6] . This results from a lack of consensus on how to formulate the pressure & temperature dependency of k where different models often yield different extrapolations. Here a novel approach to study thermal conductivity of deep earth minerals at CMB conditions using time resolved MHz X-ray diffraction and heating in a diamond anvil cell (DAC) is used to examine the thermal conductivity of Ferropericlase solid solutions. The hard X-ray beam (≈18 keV) at the European X-ray Free Electron Laser (Eu-XFEL) generates MHz pulse trains to perform time resolved measurements of heat flow in high pressure samples. Finite element modelling (FEM) is carried out utilising volume change with temperature in a sample, extracted from the diffraction data. Temperature dependent thermal conductivity is fitted to the data. We report thermal conductivity values of polycrystalline samples across the MgO- FeO region at CMB conditions.

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