POPULAR SCIENTIFIC SUMMARY

DOKTORAL CANDIDATE: Oliver Plümper

DEGREE: Philosophiae Doctor

FACULTY: Faculty of Mathematics and Natural Sciences

DEPARTMENT: **Physics of Geological Processes**

SUPERVISOR(S): **Håkon Austrheim, Bjørn Jamtveit,** Joachim Mathiesen, Øystein Prytz, Arne Olsen

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DISSERTATION TITLE: **Mantle peridotite alteration: Physicochemical aspects of mechanisms and microstructures**

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The study of Geology is a little like piecing together a series of events from a crime scene. Each event leaves an imprint on a rock both dramatic, for example changes in colour and constituents (minerals), or subtle like a slight change in a mineral's composition. Oliver Plümper's thesis sheds new light on how we can piece together a rock's history by using state-of-the-art micro and nanoanalytics to identify the tell-tale signs of each event, particularly those involving fluids. His thesis focuses on the rocks from Leka Island, the Norwegian National Geological Monument, where one of world's most up and coming resources, peridotite, can be found. These rocks are composed mainly of olivine (the mineral version of the gem peridot) and are present globally in the Earth's interior. Reactions of these rocks either on the ocean floor, just beneath it or on land provide some of the ores that we mine, building blocks for life and now are the subject of intensive investigations for the removal of man-made CO_2. Fluids are key to all these processes but the original rock is so tightly packed together that it is almost impossible for a fluid to get through it. Other rock deposits show that peridotites can be almost entirely eaten up by fluids thus; something needs to happen to break up the rock in order for the fluids to get in. One of the six studies in Oliver's doctoral thesis examines the process of cracking that occurs in these rocks by combining mineral sciences and physics, the key principle of the Centre of Physics of Geological Processes where he did his PhD. The study shows that for cracking to occur the rock must first react with the fluids to produce another mineral before a crack can be generated. The generation of a new crack allows more fluid to get in so the cracking propogates itself. Such processes are also critical in industrial schemes that plan to use these type of rocks as storage sites for man-made CO_2. In general, Oliver's investigations reveal that although fluids dramatically alter a rock, the traces of different events can survive throughout its long and complicated history.