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Discussion on 'Utilization of X-ray computed micro-tomography to evaluate iron sulphide distribution in roofing slates': *Quarterly Journal of Engineering Geology and Hydrogeology*, Vol. 51, 2018, pp. 169–178

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The paper presented by Vavro *et al.* (2018) is an interesting application of a relatively new technique, X-ray computed micro-tomography (MCT), for the determination of iron sulphides in roofing slates. Once the slate shingles are installed on a roof, these iron sulphides may oxidize, creating unattractive red stains running along the roof surface. This pathology is considered to be the main technical problem for the roofing slate industry (Cárdenes *et al.* 2016*a*). In their paper, Vavro *et al.* (2018) explain how the use of MCT allows quantification of the amount, size and spatial distribution of the iron sulphides on two samples of roofing slates. However, their work misses some important points that are worth mentioning.

As stated by the authors, the objective of the iron sulphide determination is the prediction of the oxidation potential. However, the oxidation of iron sulphides on roofing slates is determined not only by their presence and distribution. Other factors, such as mineralogy, environment and installation system, play a decisive role (Cárdenes *et al.* 2016*a*). Surprisingly, the authors do not mention the EN 12326 standard method for determining this oxidation potential, the Thermal Cycle (TC). This standardized method, together with the sulphur dioxide exposure, is considered to be the most accurate way to predict the weathering of a roofing slate. Therefore, it should be used in any study of oxidation on roofing slates, and Vavro *et al.* (2018) should have reinforced the accuracy of their conclusions with data obtained from this test.

The information obtained by Vavro *et al.* (2018) regards size and spatial distribution of iron sulphides, together with other mineral phases that they were not able to differentiate from the iron sulphides. This information is not really useful from a weathering point of view, as it does not give a prediction of the above-mentioned oxidation potential, but has an important meaning from a genetic and petrological point of view. The size distribution of micropyrite (MPy) in rocks is a proxy of the palaeoenvironmental conditions (e.g. Wilkin & Barnes 1997; Wignall & Newton 1998; Wignall *et al.* 2010). The use of MCT for accurately measuring MPy constitutes a promising line of research that can shed light on many problems derived from measuring MPy using 2D techniques, such as SEM or optical microscopy (Cárdenes *et al.* 2016*b*). This method has been also applied to the determination of the lowest boundary of metamorphism, the change from diagenesis to low-grade metamorphism (Cárdenes et al. 2018). This is missed by Vavro *et al.* (2018), who could have interpreted their resulting iron sulphide distributions from other points of view, and not just the oxidation potential.

Finally, using MCT to determine the iron oxidation potential of roofing slates is like using a sledgehammer to crack nuts. The price of an MCT analysis for this purpose is not worth the resulting data, particularly when these data are not conclusive regarding oxidation. On the other hand, TC takes longer (up to 20 days) but this method has proved to be accurate and cheap. We already explored MCT methods for the determination of the oxidation potential of roofing slates, finding no scientific or industrial value in it. The authors should reconsider the feasibility of the use of MCT to determine this oxidation potential, considering the real meaning of the data and the practical conclusions obtained.

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