Quantitative major element (stoichiometric) analysis of pyrite from varying Irish quarry sources

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Pyrite-bearing rock aggregate has the potential to become reactive when it encounters moisture and oxygen. The geochemistry of pyrite oxidation, subsequent sulphate formation and resulting expansion, has been well studied since the 1970's. Despite this, may thousands of Irish homeowners face the consequences of pyritic heave in material used between 2000 and 2013 and some concerns remain about aggregate in current use.

Limited research exists on the reactivity of aggregate in Ireland and no quantitative major elemental analysis has been performed on the pyrite. In this study, we apply quantitative major element (stoichiometric) analysis of pyrite from 6 different quarry sources. This analysis was carried out using a MIRA XMU FE-SEM (Field emission scanning electron micrscope) equipped with an Oxford X-Max 80 mm^2 detector using Aztec analytical software.

The results of the analyses indicate that much of the pyrite is non-stoichiometric in composition and that significant variation between the quarry sources exists (Figure 1). This method will potentially allow matching of unknown aggregate fill from houses to specific quarries and will pave the way for further research on pyrite reactivity.

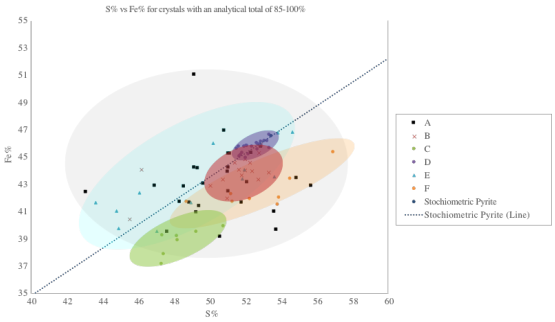

Figure 1: Separation of quarry sources (A-F) based on their major element composition