SEEN AS DIFFERENT, SOIL CLAYS BECOME MORE IMPORTANT TO SOILS AND ALSO BEYOND SOILS

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Clays contribute almost all of the surfaces and a large part – organic matter aside – of the electrical charge of soils. Therefore, knowledge of clays should enable good explanations – and predictions - of soil properties. However, clay mineralogy is in decline in both teaching and research in soil science. In large part this is because clay minerals are regarded only as highly crystalline structures. Soil clays are generally more disordered, smaller in size and more heterogeneous than 'pure' clays. If seen as comprising all secondary mineral compounds of clay (< 2 µm) sizes within soils, they may potentially play a much stronger role in explaining and predicting important properties of soils than has been the case until now.

Our work shows that clays extracted from soils without chemical treatments adsorbed more dissolved organic carbon than 'pure' clays and much more when C was removed. Removal of iron oxyhydroxide decreased organic C sorption by soil clays. Our further work including with X-ray peak decomposition techniques shows that addition of potassium, common in food and wine processing wastes resulted in subtle mineralogical changes within 2:1 aluminosilicates (including smectites and illites) which can affect the swelling and CECs of the soils.

Research on soil clays should concentrate more on poorly-crystalline minerals. Those of Fe and Al often provide strong links to organic matter. Fe oxyhydroxides are often among the first products of weathering, indicating the importance of reduction and oxidation in the process, and are nearly ubiquitous in soils in their various forms. We can speculate that the occurrence of Fe oxyhydroxides along with a clay mineral, halloysite, common in soils in northern New Zealand, may be useful in applying a demonstrated application of halloysite in cancer treatments, but further research is required.