
Mössbauer Spectra of Soil Kaolins from South-Western Australia

Tim G. St. Pierre¹, Balwant Singh², John Webb¹ and Bob Gilkes²

¹ School of Mathematical and Physical Sciences, Murdoch University Murdoch, Western Australia 6150

² Soil Science and Plant Nutrition, School of Agriculture, University of Western Australia Nedlands, Western Australia 6009

Abstract: Six well-characterized soil kaolins from widely separated sites in south-western Australia and four reference kaolins were studied by ⁵⁷Fe Mössbauer spectroscopy at room temperature after removal of non-structurally-bound iron with dithionite-citrate-bicarbonate solution. The soil kaolins and one of the reference kaolins were also studied at temperatures near 16 K. The soil kaolins were remarkably similar in crystal size, crystallinity, dehydroxylation temperature, cation exchange capacity, surface area and iron content. Mössbauer spectra of the soil kaolins at room temperature were also essentially identical consisting of a quadrupole-split doublet superimposed on a broad component which indicated that all of the iron was present as Fe(III) and that slow paramagnetic relaxation effects were present. Mean values for the chemical isomer shift and quadrupole splitting of the doublet for the soil kaolins were 0.33 and 0.55 mm/s respectively which indicates that the iron is in the octahedral sites of the kaolin lattice. The spectra of the soil kaolin samples at temperatures near 16 K showed a further slowing down of the paramagnetic relaxation and confirmed that no discrete iron oxide minerals were present.

Mössbauer spectra of the four reference kaolins at room temperature showed a doublet component similar to those for the soil kaolins. Three of them showed evidence for other spectral components including, in two cases, a component due to the presence of Fe(II).

Key Words: Iron • Kaolin • Mössbauer spectroscopy

Clays and Clay Minerals; June 1992 v. 40; no. 3; p. 341-346; DOI: [10.1346/CCMN.1992.0400315](https://doi.org/10.1346/CCMN.1992.0400315)

© 1992, The Clay Minerals Society

Clay Minerals Society (www.clays.org)
