

Types of Soil Colloids¹

Soils contain numerous types of colloids, each with its particular composition, structure, and properties (Table 8.1). The colloids most important in soils can be grouped in four major types:

¹For a review of the composition and properties of clays and humus, see Dixon and Weed (1989).

TABLE 8.1 Major Properties of Selected Soil Colloids ✓

Colloid	Type	Size, μm	Shape	Surface area, m^2/g		Interlayer spacing ^a , nm	Net charge ^b , cmol_c/kg
				External	Internal		
Smectite	2:1 silicate	0.01–1.0	Flakes	80–150	550–650	1.0–2.0	–80 to –150
Vermiculite	2:1 silicate	0.1–0.5	Plates, flakes	70–120	600–700	1.0–1.5	–100 to –200
Fine mica	2:1 silicate	0.2–2.0	Flakes	70–175	—	1.0	–10 to –40
Chlorite	2:1 silicate	0.1–2.0	Variable	70–100	—	1.41	–10 to –40
Kaolinite	1:1 silicate	0.1–5.0	Hexagonal crystals	5–30	—	0.72	–1 to –15
Gibbsite	Al-oxide	<0.1	Hexagonal crystals	80–200	—	0.48	+10 to –5
Goethite	Fe-oxide	<0.1	Variable	100–300	—	0.42	+20 to –5
Allophane & Imogolite	Noncrystalline silicates	<0.1	Hollow spheres or tubes	100–1000	—	—	+20 to –150
Humus	Organic	0.1–1.0	Amorphous	Variable ^c	—	—	–100 to –500

^aFrom the top of one layer to the next similar layer, $1 \text{ nm} = 10^{-9} \text{ m} = 10 \text{ \AA}$.

^bCentimoles of charge per kilogram of colloid (cmol_c/kg), a measure of ion exchange capacity (see Section 8.9).

^cIt is very difficult to determine the surface area of organic matter. Different procedures give values ranging from 20 to 800 m^2/g .