Supplemental Material

Manganese oxide-coated redox bars as an indicator of reducing conditions in soils

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Fig. S1. XRD random powder pattern of birnessite showing typical broad basal plane peaks at around 7.4 Å and 3.6 Å (Co radiation) as well as the non-basal plane peak at around 2.4 Å indicating turbostratic disorder (Manceau et al., 2013, Villalobos et al., 2006).
**Fig. S2.** XRD random powder pattern of birnessite incubated at 180 °C for 24 h (upper diffractogram) and at room temperature (lower diffractogram) showing typical broad basal plane peaks at around 7.4 Å and 3.6 Å (Co radiation) as well as the non-basal plane peak at around 2.4 Å indicating turbostratic disorder (Manceau et al., 2013; Villalobos et al., 2006). No mineralogical transformation caused by temperature can be assessed.

*impurity caused by sample preparation*
Fig. S3. *E*$_H$-pH diagram including the thermodynamic stability line for birnessite$^*$ (MnO$_2$/Mn$^{2+}$-system; $E_H = 1.23 - 0.03 \cdot \log 10^{-4} [\text{Mn}^{2+}] - 0.118 \cdot \text{pH}$) and ferrihydrite$^{**}$ (Fe(OH)$_3$/Fe$^{2+}$-system; $E_H = 1.06 - 0.06 \cdot \log 10^{-4} [\text{Fe}^{2+}] - 0.177 \cdot \text{pH}$) at 298.15 K, 0.101 MPa and 10$^{-4}$ M ion activity (Brümmer, 1974). The data from the microcosm experiments under oxidizing, weakly reducing and moderately reducing soil conditions are plotted as boxes into the diagram. Care must be taken in the interpretation of the diagram, because reaction rates and kinetic pathways are not considered and the assumption of chemical equilibrium is not attained under natural conditions.
References

