Species and distribution of sulfur in paddy soil profile affected by acid mine drainage in Dabaoshan sulfide mining area, South China

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Sulfur biogeochemical cycling plays an important role in the process of acidification, electron transfer and contaminant mobility in soil. In paddy soils polluted by acid mine drainage, heavy metals contamination has been studied intensively, but relatively little information has been gathered regarding the associated amounts and forms of sulfur. Dabaoshan Mining area (24°34′28″N, 113°43′42″E) was the largest polymetallic sulfide mine in southern China. Due to flush irrigation, the soil was polluted by enormous amounts of S^{2-}, SO_4^{2-}, Cu, Pb, Cd, Zn and Fe-rich mine wastes in the early stage. Investigation had been done focusing on the concentration, distribution and transformations of sulfur species in AMD-contaminated paddy soil located along the AMD affected River.

A 2-year monitoring study of spatial changes of sulfur in the AMD-irrigated paddy soil were conducted. Results showed that there was no significant difference in total sulfur and water-soluble sulfate content in paddy soilsfrom the upstream to downstream, however, the soil profile could be divided into three layers (0-20 cm, 20-30 cm and 30-80 cm) by sulfur species and concentrations. Organic sulfur and reduced inorganic sulfur were the two highest species in 0-20 cm depth, and were significantly positively correlated with total soil C and N contents. Samples from 20-30 cm depth had the largest amount of AS, which could reflect the presence of amorphous iron hydroxide, large Brunauer-Emmett-Teller (BET) surface area and fine clays. Adsorbed sulfate and ester sulfur were the domain sulfur in 30-80 cm depth. In short, soil particle-size, total soil C and N, mineral composition and seasonal variations contributed to the species, distribution and transformation of sulfur in the soil profile.

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