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Remediation of Cd-contaminated soil around metal sulfide mines

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The mines of metal sulfides are widely distributed in the southwestern part of Zhejiang Province, Southeast China. The activities of mining, however, often lead to the severe pollution of heavy metals in soils, especially Cd contamination. According to our field investigations, the spatial distribution of Cd-contaminated soils is highly consistent with the presence of metal sulfide mines in the areas, further proving that the mining activities are responsible for Cd accumulation in the soils. To study the remediation of Cd-contaminated soils, a paddy field nearby large sulfide mines, with soil pH 6 and Cd more than 1.56 mg kg^{-1}, five times higher than the national recommended threshold, was selected. Plastic boards were deeply inserted into soil to separate the field and make experimental plots, with each plot being 4 m$\times$4 m. Six treatments, TK01$\sim$TK06, were designed to study the effects of different experimental materials on remediating Cd-contaminated soils. The treatment of TK01 was the addition of 100 kg zeolites to the plot; TK02, 100 kg apatites; TK03, 100 kg humid manure; TK04, 50 kg zeolites + 50 kg apatites; TK05, 50 kg zeolites + 50 kg humid manure; TK06 was blank control (CK). One month after the treatments, soil samples at the plots were collected to study the possible change of chemical forms of Cd in the soils. The results indicated that these treatments reduced the content of available Cd in the soils effectively, by a decreasing sequence of TK04 (33%) $>$ TK02 (25%) $>$ TK01 (23%) $>$ TK05 (22%) $>$ TK03 (15%), on the basis of CK. Correspondingly, the treatments also reduced the content of Cd in rice grains significantly, by a similar decreasing sequence of TK04 (83%) $>$ TK02 (77%) $>$ TK05 (63%) $>$ TK01 (47%) $>$ TK03 (27%). The content of Cd in the rice grains was 0.071 mg kg^{-1}, 0.094 mg kg^{-1}, 0.159 mg kg^{-1}, 0.22 mg kg^{-1} and 0.306 mg kg^{-1}, respectively, compared with CK, 0.418 mg kg^{-1}. This experiment suggested that the reduction of available Cd in the soils is the key to the remediation of Cd-contaminated soils, and apply the composite material of zeolite combining apatite is the best choice for the remediation of Cd-contaminated soils.