An assessment of soil contamination due to selenium around an ash pond of a coal-based thermal power plant in China

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Nowadays, coal-based thermal power plants still provide the majority of energy in China. But combustion of coals is one of the major sources of environmental pollution due to generation of huge amounts of ashes, which are disposed off in ash ponds in the vicinity of the thermal power plants. The ash pond pollution researches are focused on the heavy metals contamination, seldom touch the nonmetals. It's worth noting that selenium is the marker element of coal, and excess of Se is a potential health risk. An attempt has been made to delineate soil contamination due to selenium around a super-huge thermal power plant located at Zhengjiang, Jiangsu Province, China. Selenium concentrations of top soils, soils collected from the different depth profiles, irrigation waters, bedrocks, ashes, paddy rice and vegetables are detected at AFS-820. Selenium concentration of top soils ranges from 0.15 to 6.12 mg/kg (avg 0.99mg/kg). Selenium concentration of irrigation waters ranges from 0.002 to 0.29 mg/l (avg 0.10mg/l). Selenium concentration of bedrock ranges from 0.09 to 0.21 mg/kg (avg 0.14mg/kg). Selenium concentration in paddy rice ranges from 0.04 to 1.12 mg/kg (avg 0.25mg/kg). Selenium concentration in vegetables ranges from 0.008 to 0.33 mg/kg (avg 0.069mg/kg).The background value of Selenium is 0.11±0.02 mg/kg. The Selenium variation coefficients of top soils is 1.37. Results show that: (1)the high Selenium level in top soils is mainly caused by long-term of ash pond and sewage irrigation other than bedrock, and the ash pond is the essential Selenium pollution source; (2)Selenium concentration in paddy rice is positively correlated with the total Selenium concentration, but vegetables not; (3) the series pollution range due to ash pond is about 1~2 km; (4)the Selenium contamination depth is nearly 40~50cm, and Selenium contamination approach background value below the depth.

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The geochemical characteristics of hydrocarbon source rocks in Pingle Depression, Jiangxi Province

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Pingle Depression is a comprehensive marine petrolum system in Jiangxi Province of China. It is dominated by Permian-Triassic carbonate, shale, mudstone, and coal as hydrocarbon source rocks.

As it shows in the Table1, the carbonates of lower-middle Permian Chihsia, Maokou formation and upper Triassic Dalong formation are very low in total organic carbon (TOC, the average of TOC is 0.32%), extractable organic matter (EOM, the average of 'A' is 13.65×10^{-6}) and hydrocarbon generation potentials (the average of S_1+S_2 is 0.04mg/g). The upper Permian Longtan formation and upper Triassic Anyuan formation are abominated by dark mudstone, shale, and coal as hydrocarbon source rock. Their TOC, EOM and hydrocarbon generation potentials are much higher than carbonate. Their EOM contents vary within a wide range, and the EOM contents of most samples are small. Macerals of the Permian-Triassic source rocks are mainly vitrinite, inertinite comes second. Exinite is hardly found in carbonate, and can be found in mudstone, shale and coal. Macerals indicate the kerogen in source rocks are type III. In addition, a relatively large number of bitumen is found in carbonate. The Tmax and Ro varies from low-mature to overmature, maturity of source rocks is west high east low. In all, the mudstone and coal of Longtan formation and Anyuan formation are relatively better source rock in Pingle Depression.

Series Epoch	Lithology	TOC (%)	S1+S2 (mg/g)	"A" (10^{-6})
P_1q P_2m	Carbonate	0.32(20) / 0.03-0.98	0.04(17) / 0.01-0.28	13.65(16) / 2.46-52.38
P_3l	Mudstone	4.39(82) / 0.01-69.51	12.97(39) / 0-356.29	1166.83(27) / 7.91-24993.7
P_3l	Carbonate	1.14(5) / 0.05-4.12	0.02(3) / 0.01-0.03	13.55(3) / 11.16-16.28
P_3l	Coal	55.49(12) / 38.83-77.38	88.00(98) / 0.12-370.09	7267.36(6) / 11.88-23828.9
T_3a	Mudstone	2.84(173) / 0-43.15	1.84(53) / 0.04-46.32	295.01(7) / 9.08-994.14
T_3a	Coal	20.65(7) / 2.3-43.82	6.29(4) / 0.8-9.64	901.65(3) / 9.62-2101.36

Average (Sample number)
Min—Max

Table 1: The geochemistry data of Permian-Triassic rock in Pingle depression.