Blight of the trees by sulfur oxide-Neutralization of acid soil and retrench of CO2 by charcoal-

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1.Preface When fossil fuel is used for the generation of electric power, as an energy source and for automobile engines all over the world, sulfur oxides are released into the atmosphere and finally changed to sulfuric acid. Sulfuric acid is distributed around the world with the wind, and is killing massively the south-pole beech on Fuego Island at the southern end of South America and on South Island of New Zealand. Sulfuric acid attached to the leaves and barks of trees is concentrated and accumulated. The leaves drop to the ground, acidify the soil, make the metallic components in the soil soluble sulfate, and change the NaCl carried by wind to Cl2 by the reaction with MnO2 in the soil. Simultaneously produced NaHSO4 and MnSO4 are deliquescence and are discharged by mist or slight moisture in the air.Cl2 damages the cells in contact, and the increasing concentrations of soluble sulfate cause shortage of water in cells osmotically, decaying and withering the trees. Charcoal is most suitable for neutralization of acidified soil. It contains oxidized compounds of K and Ca, which are absorbed for plant growth, and OH eluted from the compounds with rainwater neutralizes the acid. The remaining K and Ca are again used by trees as nutrients, and the charcoal, which adsorbs water and nutrients, helps activation of soil where the microorganisms grow. Charcoal is produced by the heat of combustion of the trees themselves, and the trees for the charcoal are burned in a hole dug near the trees.In addition, trees absorb CO2 and grow using solar energy, which is the most energy-saving method of carbon fixation. The charcoal is never decomposed to CO2 unless it is burned, and is useful for reducing global CO2.

2. Sampling and determination method

The bark was cut at one meter from the surface of the earth.The place of sampling of soil is the surface of the ground, 10cm and 30cm in depth under the tree and the determination was carried out with dried samples in the room.25g water was incubated with 10g dried sample. Solution after 60mimutes was separated from the sample by filtration with filter paper. The pH, ion and metallic component in filtrate were measured with pH meter (HORIBA D-21), ion chromatography (DIONEX Q1c,DX100) and ICP-AES (Seiko Instruments Inc. SPS3000 Plasma Spectrometer). The charcoal was manufactured with IWASAKI OVEN to investigate. IWASAKI OVEN connected with digital thermometer (ANRITU HFT-50), temperature control (OMURON ECN-RC) and digital tester (MASTECH MAS838). Temperature of carbonization is 700, 800, 900, 1000, 1100+-5 degree. The charcoals which passed thorough 2mm mesh and remained on 1mm mesh were used. Determination method of charcoal was carried out in the same manner as the soil.

3. Conclusion

The concentration of K in the charcoal differs by the kinds of the branch, trunk and tree. The concentration of component which dissolves into water in 60minute differs by temperature of carbonization. The charcoal of about 2 tons in 7 hectare forest was scattered every year. pH of the soil under the Japanese oak was pH 4.46 at the first year, pH 4,69 at the second year and pH 5.53 at the third year. The Japanese red pine was pH4.37,pH 4.43,and pH4.97. The Japanese cedar was pH4.47, pH4.61 and pH4.91. pH of the soil are going up by charcoal. The soil with charcoal and without charcoal was prepared in Ashio copper mine and it is left from October 1999 to August 2003. pH of soil with charcoal was pH5.54 and pH of depth of 10cm was 4.58 and 10 kinds of species of vegetation germinated.pH of the soil without charcoal was4.91 and pH of depth of 10cm was4.46 and the soil was covered with fern and four kinds of vegetation.