

Oxidation of Sulfite in FGD to Sulfate When Applied to the Soil Surface

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ABSTRACT

The use of high-sulfur coal for power generation in the United States requires the removal of sulfur dioxide (SO₂) produced during burning in order to meet clean air regulations. If SO₂ is removed from the flue gas using a wet scrubber without forced air oxidation, much of the S product created will contain as much as 30-50% of the S as sulfite (SO₃²⁻). Plants only take up S in the form of sulfate (SO₄²⁻), and SO₃²⁻ is toxic to plants and may cause damage to plant roots. For agricultural uses, SO₃²⁻ in FGD products must oxidize to SO₄²⁻ in soils before crops are planted. However, there is little information about the oxidation of the SO₃²⁻ in FGD product to SO₄²⁻ in the field. A SO₃²⁻-containing FGD product obtained from American Electric Power Company was applied at rates of 0, 1.12 and 3.36 Mg ha⁻¹ to the surface of an agricultural soil (Wooster silt loam, Oxyaquic Fragiudalf). The SO₄²⁻ in the surface soil (0-10 cm) was analyzed on days 0, 3, 7, 17, 31, 45, and 61. The movement of SO₄²⁻ through the 0-100 cm soil layer was also determined on day 61. Results indicated that SO₃²⁻ in the FGD product rapidly oxidized to SO₄²⁻ on the field surface during the first week and most of the S moved downward into the soil during the experimental period of two months. It is safe for plants if the SO₃²⁻-containing FGD product is applied to the field surface one month before planting. However, application too long before planting may cause much of the S plant uptake to be lost due to leaching or other soil processes.

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