

Title

Microscale Arsenic (As) Chemical Speciation in Poultry Litter.

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abstract

In the USA, interest in As has been recently heightened by the controversy over setting the MCL of total As in drinking water at 5ppb. Concerns have been raised recently about long-term As inputs into soil and water environments from poultry manure/litter amendments. The origin of As in the poultry manure/litter is organo-arsenical compounds (e.g., Roxasone) that are present in poultry feed to control coccidiosis and to improve feed conversion. Feed spillage and digested materials lead to a mean total As concentration in the poultry manure/litter of 14-76 mg/kg. In this study, the solid state chemical speciation of As in the poultry litter was investigated using synchrotron-based surface probing techniques (Microfocused Synchrotron X-ray fluorescence (SXRF) spectroscopy and X-ray Absorption Near Edge Structure spectroscopy (XANES)). Arsenic was concentrated in a needle-like particle morphology (~ 20nm X 100nm) in the litter materials, and the SXRF analysis showed As associated with Cu and Cl and to a lesser extent with S and Zn. In addition, XANES analysis showed that mixed As(III and V) oxidation states were always present. These results indicate that the structure of Roxasone in the litter materials has been altered during digestion processes and/or via biodegradation over time. The chemical speciation of As will be further characterized using microscopic and vibrational spectroscopic techniques.

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