Comparison of soil humic acids and lignohumates

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Humic acids are among the most important constituents of soil humic substances, because of relating to soil yield. They are of great importance not only in soil, but also for solving environmental problems, in industry, and medicine. Considerable effort has been made in their research. In spite of that, there is still up-to-date improving of their identification methods. Determination of their structure is quite complicated and usually elemental composition and non-destructive spectral techniques are applied. In this work, SFS, FTIR, and ^{13}C NMR spectroscopy were used for detailed characterization of soil HA and lignohumates. ^{13}C NMR spectroscopy help us quantitatively detect different types of carbon (e.g. carbonyl, carboxyl, aromatic, olefinic, anomers, and aliphatic carbon). Percentage of aromatic and aliphatic carbons allows us to calculate aromaticity degree. We came to the conclusion that soil HA contained higher amount of aromatic carbon and less aliphatic carbon to compare with lignohumate. ^{13}C NMR spectrum of lignohumates (Fig. 1) indicated presence of phenolic carbon (C=O) at 143-157 ppm; sp3 carbon (C-O) at 43-87 ppm; aliphatic and methoxylic groups at 50-60 ppm; long ring –O–alkyl and –CH_2– groups at 30 ppm. Less content of aromatic carbon (region 106 – 157 ppm) and more aliphatic carbon (region 15-106 ppm) was found in lignohumates. Indexes calculated from different spectral measurements are considered as a very important indicators of HA quality and origin.
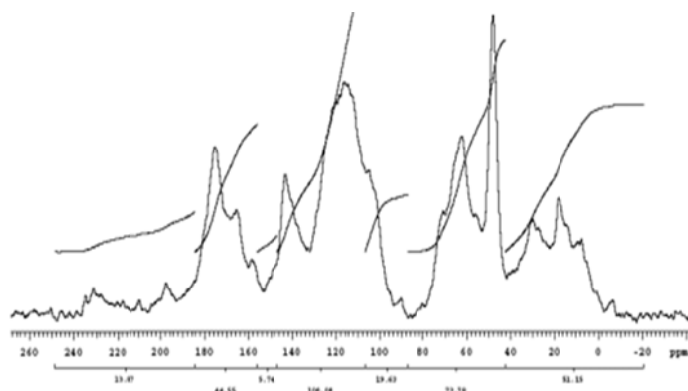

Figure 1. ^{13}C NMR spectrum of lignohumate.

References
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