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HUMIC ACIDS FROM COAL TAILING OBTAINED BY ELECTROOXIDATION AND ITS CHARACTERIZATION by ^{13}C NMR CP/MAS

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The use of mineral coal as an energetic source is increasing in the last years, mainly due to the raise of the prices of the fossil fuels. In the specific case of Brazil, where the coal is of low rank and contains a relatively high proportion of ashes, this increase in the coal exploitation results in a production of a great amount of coal tailing. The storage of this coal waste in open ditches has a strong impact on the environment, like the generation of acid mine drainage due to the high amount of pyrite and the production of particulate matter. The carbon content the coal tailing as high as 15% turns this material as a possible source for soil conditioner or as a strong adsorbent for waste water treatment. In this context, the present work aimed to investigate the obtention of humic acids (HA) from coal tailing samples from South Brazil (RS) employing an eletrooxidation method and comparing HA yield and chemical composition with those obtained by the alkaline extraction. The HA yield was determined gravimetrically and they were characterized by elemental analyses and ^{13}C NMR CP/MAS spectroscopy. The HA yield obtained by the alkaline extraction was approximately 3.4 % whilst by the electrooxidation method values as high as 12 % were obtained. The highest yield was obtained by applying 1.2 Volts and 100 mA and employing a solution of 40% sulfuric acid at 80 °C. The chemical composition of the coal HA, as determined by ^{13}C NMR, was highly aromatic (54 %) followed by aliphatic groups (34%). The proportion of oxygen containing groups was relatively low: 6% of O-alkyl groups, 3 % of COO⁻ groups and 3 % of C=O groups. This composition differs from that usually found for soil HA, where the O-alkyl and carboxylic groups composed about 40 to 50% of the HA structure. Our results indicate that the electrooxidation method may represent a viable method for the obtention of HA from coal materials, but further investigation is needed in order to improve the content of oxygen containing groups.

Keyword: Electrooxidation; Humic acids; Coal tailing.