POTENTIO METRIC BEHAVIOUR OF EXTRACTED HUMIC ACID IN NON-AQUEOUS MEDIA

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From potentiometric titrations of extracted humic acids in dimethyl formalide and dimethyl sulfoxide using 0.1 N CH_3ONa in benzene–methanol with antimony-glass electrodes system, DMSO appears to be a better solvent compared to DMF for non-aqueous titrimetry for humic acids extracted from soils of Gujarat.

Humic acids extracted from different soils can be titrated against an alkali in aqueous medium. In non-aqueous medium they can be titrated using sodium methoxide in benzene-methanol. Humic acids are heteropoly condensates of phenolic substances with or without participation of amino acids.[1]

Humic acid is insoluble in water, but most completely soluble in DMF and DMSO DMF, pyridine and ethylene diamine are good non-aqueous solvents for humic acid Wright and Schnitzer [2,3] potentiometrically titrated the organic preparations dissolved or suspended in pyridine, DMF and ethylene-diamine with sodium amino ethoxides. One inflation point corresponded approximately to free-COOH group of humic acid. In the case of DMF, only one inflexion point was obtained even when the substance had more functional groups. As compared to DMF, ethylene–diamine gave reasonably satisfactory curves with more inflexions.

Van Dijk [4] compared potentiometric, conductometric and high frequency titrations of humic acid preparations in a variety of aqueous and non-aqueous media. High frequency titrations of humic acids in DMF, with sodium isopropylate give good results for certain type of acid grouping, presumably-COOH, but less satisfactory results for weaker acidic groups such as phenolic hydroxyls.

Glebko et al [5] have proposed a micro method for determination of –COOH and–OH (phenolic) groups in humic acids by high frequency titration of 1:1 DMSO + pyridine solutions of CH_3ONa in the same solvent system It is reported by Dzhumantyokov et al [6] that DMSO is not harmful to soil micro–organisms and hence it is a better solvent for humic acids than neutral and alkaline solvents.

EXPERIMENTAL

Humic acids were extracted from four different soils of Gujarat (Ahwa, Junagadh, Piplod and Rajkot) by sodium carbonate method These acids were purified by HCL + HF treatment, dialysis and ion-exchange (Amberlite IR-120) column [7–9] and were studied potentiometrically in non-aqueous media.

0.01 gm of extracted humic acid was aken in 50ml DMF and DMSO (kept overnight) and titrated against 0.085N CH_3ON_a in benzene-methanol, using antimony–glass electrodes system. Beckman pH meter was used.

Figures 1 and 2 present potentiometric curves for DMSO and DMF.

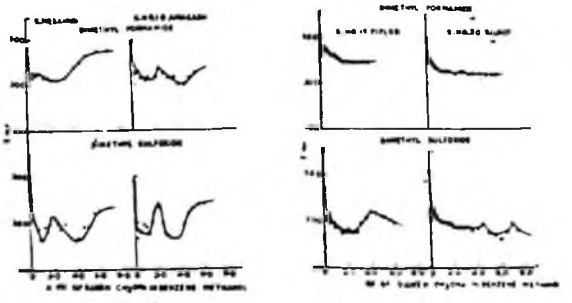


FIG 1 FIG 2
POTENTIOMETRIC TITRATIONS OF HUMIC ACIDS

DISCUSSION

DMF is a basic solvent used for characterization of weak acids. Some workers [2–5] have already used DMF, and they conclude that it gives only one inflexion point. In the case of Ahwa forest soil, the characterization is better; however, in some cases, even one dissociation stage is not represented. This indi-

cates interaction between functional groups of humic acid and solvent which will not be useful for critical study of the dissociation of humic acids in a non-aqueous system.

In DMSO, the second and the thir l dissociation stages seem to be prominently marked as compared to its behaviour in water. Somehow the first dissociation is poorly marked as compared to water. This may be attributed to a preferential interaction between some functional groups of the substance and solvent. There is a good concordance between the inflexion points inwater and DMSO in many cases [10]. Hence, it appears to be a good solvent for the study of humic acids.

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