

FLUORESCENT INDICATORS
FOR
SOLVENT POLARITY BASED ON
PHOTO INDUCED ELECTRON TRANSFER

A thesis submitted in partial fulfilment of the requirements
for the degree of Master of Science of the University of
Colombo

by

T.K.S.D. SAMARASINGHE

31st October 1984

424786

INTRODUCTION

The properties of solvents have been extremely important where the control and management of reaction rates are concerned. Out of all important physical properties the polarity of a solvent plays a major part when a reaction under study involves formation or destruction of charged species. Even though the "polarity of a solvent" has been understood for a long time there was no proper theoretical definition for it. Therefore absolute polarity figures could not be established for any of the known solvents. This is mainly because the polarity is not a single characteristic of a solvent but is the resultant effect of several component parameters.

The empirical polarity scales¹ were based on the effect of solvent polarity on standard reactions where the solvent acted as the reaction medium. It is clear that the study of a reaction is not ideally suited for determining the polarity of a solvent even on a relative basis because there are number of other solvent properties which can drastically influence the reaction. But even in present days, polarity scales are based on the study of the influence of the reaction medium (solvent) on standard chemical reactions solely for the sake of convenience and sensitivity. The study of kinetics and thermodynamics of thermal reactions and spectral properties are the major approaches in this area of study. Whatever the determined parameter would be it must be at least roughly linearly dependent on solvent polarity which facilitates us to establish a polarity scale. The free energy of a standard reaction seems to be solvent dependent and kinetics, thermodynamics and spectral transition energies give the linear relationship between the two variables. Though it should be noted that linearity is not essential for this type of work, since polarity is quite vague anyway.

Grunwald's and Winstein's Y scale² is based on the assumption that the free energy of activation of an ionisation reaction is linearly dependent on solvent polarity where the polarization and