

## RESEARCH PAPERS

## 三辛胺萃取丁二酸、苹果酸、马来酸、富马酸特性的研究

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**摘要** Extraction equilibrium features of succinic acid, malic acid, maleic acid and fumaric acid were investigated systematically with trioctylamine (TOA) in chloroform, 4-methyl-2-pentanone (MIBK) and 1-octanol. Fourier transform-infrared (FTIR) spectroscopic analysis of organic samples loaded with the acid shows that amine forms 1:1 complex of ion-pair association with succinic acid, malic acid and maleic acid, and 1:1, 2:1 complex of ion-pair association with fumaric acid. It is proposed that the complex forms depend on the second dissociation constant of the dibasic acid,  $pK_{a2}$ . Results of equilibrium experiments show that diluents affect extraction behavior, and depend on the solute concentration. Protic diluents, chloroform and 1-octanol, are more effective than the others when the equilibrium solute concentration is lower than 1:1 stoichiometry of TOA to acid, otherwise the extraction ability shows that MIBK>1-octanol>chloroform for malic and maleic acids, and 1-octanol>MIBK>chloroform for succinic acid. Overloading (solute concentration in organic phase is larger than TOA concentration) appears for all of the studied acids, and the sequence of overloading amount is the same as that of distribution constant of diluent. The results show that the sequence of extraction ability of different acid is the same as that of acidity at low equilibrium solute concentrations, while it is the same as the sequence of hydrophobicity at high equilibrium concentrations.

**关键词** [succinic acid](#) [malic acid](#) [maleic acid](#) [fumaric acid](#) [ion-pair association](#) [extraction behavior](#)

分类号

## Equilibrium of Extraction of Succinic, Malic, Maleic and Fumaric Acids with Trioctylamine

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### Abstract

Extraction equilibrium features of succinic acid, malic acid, maleic acid and fumaric acid were investigated systematically with trioctylamine (TOA) in chloroform, 4-methyl-2-pentanone (MIBK) and 1-octanol. Fourier transform-infrared (FTIR) spectroscopic analysis of organic samples loaded with the acid shows that amine forms 1:1 complex of ion-pair association with succinic acid, malic acid and maleic acid, and 1:1, 2:1 complex of ion-pair association with fumaric acid. It is proposed that the complex forms depend on the second dissociation constant of the dibasic acid,  $pK_{a2}$ . Results of equilibrium experiments show that diluents affect extraction behavior, and depend on the solute concentration. Protic diluents, chloroform and 1-octanol, are more effective than the others when the equilibrium solute concentration is lower than 1:1 stoichiometry of TOA to acid, otherwise the extraction ability shows that MIBK>1-octanol>chloroform for malic and maleic acids, and 1-octanol>MIBK>chloroform for succinic acid. Overloading (solute concentration in organic phase is larger than TOA concentration) appears for all of the studied acids, and the sequence of overloading amount is the same as that of distribution constant of diluent. The results show that the sequence of extraction ability of different acid is the same as that of acidity at low equilibrium solute concentrations, while it is the same as the sequence of hydrophobicity at high equilibrium concentrations.

**Key words** [succinic acid](#) [malic acid](#) [maleic acid](#) [fumaric acid](#) [ion-pair association](#) [extraction behavior](#)

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