Non-linear absorbance change in dichloromethane and alcohol

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Introduction

Dichloromethane is widely used as a solvent, especially, for acetate fiber and tri-acetylcellulose (TAC) film. The TAC film is now important material as an anti-glare film for flat panel display (FPD). Usually, alcohol is added for two purposes. One is as a scavenger to prevent resolving into phosgene and hydrogen chloride. The other is to control volatilization speed to maintain the correct manufacturing conditions. During the controlling of the mixing rate of dichloromethane and alcohol, we found that the spectra had strong non-linearity, which does not follow the Lambert-Beer's law. How the non-linearity affects the manufacturing has not yet been investigated, though, in this area there is a possibility of making the manufacturing process more efficient.

Materials and methods

Dichloromethane and methanol were prepared and mixed in the ratio from 0 to 100%. The NIR spectra of the transparent mixture were measured by a NR800 instrument (Yokogawa Electric Corp.) with 2 mm path-length. As well as methanol, butanol, acetone and toluene were also mixed with dichloromethane and the spectra measured.

Results and discussion

Figure 1 shows the spectra. The difference of concentration between spectra is 10%. Three arrows show non-linear peaks. They occur at 10367, 7058 and 4945 cm-1. These peaks can also be seen in case of mixtures with butanol, but they cannot be seen in case of acetone and toluene (Figure 2). Therefore, they are believed to be caused by inter-molecular bonds between Cl, and the H of the OH bond in alcohol. The largest peak height change was when alcohol concentration was increased from 0 to 10%. To analyse the phenomena in more detail may contribute to the improvement of the TAC film manufacturing line.

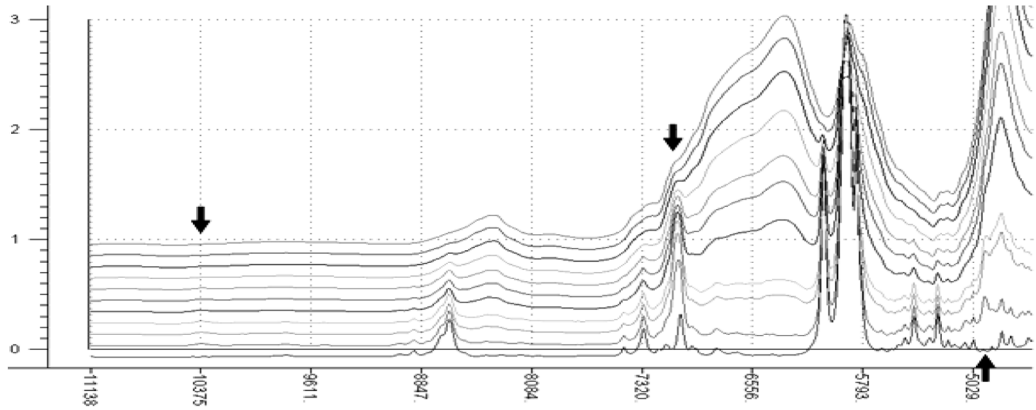

Figure 1. Spectra of dichloromethane mixed with methanol. (X: wavenumber [cm^{-1}], Y:absorbance [Abs]). Bottom: dichloromethane 100%, Top: methanol 100%. Arrows show non-linear peaks.

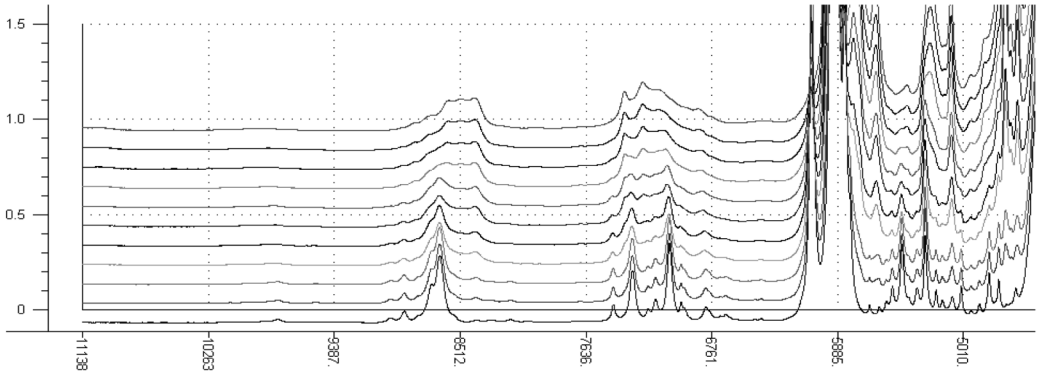

Figure 2. Spectra of dichloromethane mixed with acetone. (X: wavenumber [cm^{-1}], Y:absorbance [Abs]). Bottom: dichloromethane 100%, Top: acetone 100%.