

Abstract:

JFE See ha de'e , ed a d c e' cia i ed a e
PET- a i a ed i fee ee (TFS) hee f, f d ca ,
UNIVERSAL BRITE T, e F, hich a i ed he, e-
f, a ce, e i e e f, f d ca a d i a e i-
e -f i e d . A fea , e , UNIVERSAL BRITE
T, e F ha a exce e ba a ce f high f, abi i a d
he c e , e ea e , , e , hich i , e i ed i f d
ca i g a , ica i . A exce e c e , e ea e , , -
e , a , ea i ed b addi g , igi a , face- dif i g
addi i e he , e h e e e e h ha a e (PET)
, ed ce he , face fee e e g f he PET . F ,
abi i i a ed i , , (ed b a , i g a c bi a i
f a e h , e PET (h -PET) i h a
i e , c , e a d a , igi a a i a i g ech g
hich i hibi PET c a i a i .

1. Introduction

From the . ie poin of pr e e q ing the global en i-
ronmen and impro ing the labor en ironmen d ring
pain ing ork, in recen ears, the can-making ind s-
tr has a oided the se of organic sol en s in pain ing,
ei her b con e r ing to a er sol ble lacq er or adop-
ing thermoplas ic resin lamina ed flms as an s b i t e
for pain . Agains this backgro nd, cans prod ced from
eel shee s lamina ed i h a pol e h lene t erephal-
a e (PET) flm ha e alread been commerciali ed in
the eld of be erage cans¹). As ad an ages of flm-
lamina ed eel shee s, beca se the pain ing/baking
process req ired i h con en ional pain ed ma erials
can be omi ed, (1) cos s are red ced b elimina ing this

of breaking or cracking. Although it is possible to produce draw-redrawn (DRD) food cans using copolymer PET-laminated steel sheets²⁾, the high cost of the film (due to the high cost of the copolymer component) is a problem. Application of inexpensive homopolymer PET (homo-PET) film-laminated steel sheets is desirable as a solution to this problem, because homo-PET films have a remarkably high crystallization kinetic in comparison with copolymer PET films³⁾, rapid crystallization occurs during can-making due to the stress and heat generated by the bending and drawing processes. As a result, this material is suitable for forming and could not be applied in can-making. JFE Steel therefore carried out an investigation focusing on techniques for inhibiting crystallization of the PET film, and studied application of a new type of homo-PET film⁴⁾ in which crystallization behavior is inhibited by reducing the mobility of the PET molecules. As a disadvantage of this technique, the molecular structure of the PET is controlled so that some amorphous molecules form a quasi-bridge structure, thereby reducing their mobility.

- (3) In the external appearance of food cans, a color tone (metallic color, etc.) with a rich luster is required. For this reason, it is necessary to impart an appearance with a metallic color to laminated steel sheets for food cans by adding a colorant to the film. However, if heat treatment such as reflow crystallization (125 °C, 90 min) of the cans is performed, the colorant tends to lose its color due to migration/segregation of the film surface, deteriorating the design property. Therefore, a technique for inhibiting this phenomenon of heat-induced migration of the colorant is studied.

3. Experimental Method

3.1 Specimens

The samples used for film lamination as a tin free steel (TFS) of low carbon aluminum-killed composition are cast steel (Temperature: T3CA, Thickness: 0.24 mm) with a metallic chromium coating weight of 120 mg/m² and chromium dioxide coating weight of 15 mg/m² (as Cr content). Surface free energy is adjusted by laminating a new type of biaxially-oriented homo-PET film (Thickness: 15 μm), to which surface-modifying additives had been added, to the surface of mofas qho03 T (nq 88 (TFS) appearaT*0.2is conrol)lmo-20.sho

as used as the BO. al e. Here, X-ray diffraction measurements were performed by $Co K\alpha$ at a tube voltage of 40 kV and current of 100 mA, using a RINT2400V diffractometer by Rigaku Corp. In this paper, a BO. al e BO/BO_0 , which was obtained by standardizing the BO. al e after lamination by the BO. al e before lamination (BO_0), was used as a biaxial orientation.

4. Experimental Results

4.1 Results of Study of Content Release Property

The results of an investigation of the effect of surface free energy on the content release property are shown in Fig. 2. A clear relationship can be observed, in which the content release property improves as surface free energy decreases.

The surface free energy of the specimens was adjusted by adding surface-modifying additives to the PET film. Therefore, the effect of each of the surface-modifying additives was investigated. Table 2 shows the surface-modifying additives used here. Additive A

is silicone and is non-polar. Additive B is a fatty acid ester which has polarity in the carbon part, as well as a non-polar part in the hydrocarbon chain. Additive C is a vegetable oil. Like Additive B, it consists mainly of a fatty acid ester, but due to the large carbon number of the hydrocarbon chain, the non-polar part forms the main structure of Additive C.

The effects of these surface-modifying additives are shown in Fig. 3. From these results, it can be understood



