mechanical strength. In case where the MFR thereof is too low, this EVOH resin tends to show impaired extrudability during molding.

[0052]

The ethylene-vinyl alcohol copolymer of the invention has carboxylic acid ester group at polymer terminal thereof, and the content thereof is as shown hereinabove.

[0053]

The ethylene-vinyl alcohol copolymer of the invention may have carboxylic acid group, carboxylic acid salt group, e.g., sodium carboxylate, and lactone ring group at polymer terminal thereof.

[0054]

The ethylene-vinyl alcohol copolymer of the invention may further contain structural units derived from the following comonomers. The comonomers include α-olefins such as propylene, isobutene, α-octene, α-dodecene, and α-octadecene, hydroxyl-containing α-olefins such as 3-buten-1-ol, 4-penten-1-ol, and 3-butene-1,2-diol, hydroxyl-containing α-olefin derivatives such as products of esterification or acylation of these hydroxyl-containing α-olefins, hydroxyalkylvinylidenes such as 2-methylenepropane-1,3-diol and 3-methylenepentane-1,5-diol, hydroxyalkylvinylidne diacetates such as 1,3-diacetoxy-2-methylenepropane, 1,3-dipropionyloxy-2-methylenepropane, and 1,3-dibutyryloxy-2-methylenepropane, unsaturated carboxylic acids or salts, partial or complete alkyl esters, nitriles, amides, or anhydrides of the acids, unsaturated sulfonic acids or salts thereof, vinylsilane compounds, vinyl chloride, and styrene. One of these can be used alone, or two or more thereof can be used in combination.

[0055]

The ethylene-vinyl alcohol copolymer of the invention can be used as such. However, compounding ingredients generally incorporated into EVOH resins may have been incorporated into the ethylene-vinyl alcohol copolymer of the invention so long as the effects of the invention are not lessened thereby. Examples of the compounding ingredients include heat stabilizers, antistatic agents, colorants, ultraviolet absorbers, lubricants, plasticizers, light stabilizers, surfactants, antibacterials, drying agents, antiblocking agents, flame retardants, crosslinking agents, hardeners, blowing agents, nucleators, antifogging agents, additives for biodegradation, silane coupling agents, and oxygen absorbers.

[0056]

As the heat stabilizers, additives may be added for the purpose of improving various properties including the thermal stability during melt molding.

The content of carboxylic acid groups (Z) based on the sum (P), the content of sodium carboxylate groups (W) based on the sum (P), and the content of lactone ring groups (X) based on the sum (P) were determined from the values for the respective peaks obtained in (1-3) above.

[0084]

The results obtained in (1-1) to (1-3) above are shown in Table 1.

[0085]

(Example 2)

An ethylene-vinyl acetate copolymer was produced in the same manner as in Example 1, except that the amount of the sodium methoxide to be introduced for the saponification was changed to 50 equivalents, the amount of the sodium methoxide to be supplied secondly was changed to 50 equivalents, and the amount of the acetic acid to be used for terminating the saponification reaction was changed to 2.5 parts.

[0086]

The melting point of the EVOH resin was measured, and the terminal methyl ester group content, the carboxylic acid methyl ester group content, and the content of the carboxylic acid methyl ester groups based on the total content of the carboxylic acid methyl ester groups, carboxylic acid groups, sodium carboxylate groups, and lactone ring groups were determined, in the same manners as in Example 1. The results thereof are shown in Table 1.

[0087]

(Comparative Example 1)

An ethylene-vinyl acetate copolymer was produced in the same manner as in Example 1, except that the sodium methoxide to be supplied for the saponification reaction was replaced with sodium hydroxide, the sodium methoxide to be supplied secondly was replaced with sodium hydroxide, and the termination of the saponification reaction by the addition of acetic acid was omitted.

[0088]

The melting point of the EVOH resin was measured in the same manner as in Example 1.

Furthermore, in the same manner as in (1-2) above, the EVOH resin obtained was examined by ^{1}H-^{13}C HSQC spectroscopy (solvent, heavy DMF/heavy water = 70/30 (by weight)) using examination apparatus “400 MHz NMR” (trade name; manufactured by Bruker Biospin K.K.). The two-dimensional NMR chart obtained is shown in Fig. 4. The NMR chart of Fig. 4 had no correlation peak in either of the positions corresponding to the <3> and

Claims

[Claim 1] An ethylene-vinyl alcohol copolymer comprising:

a carboxylic acid ester group at a polymer terminal,

wherein a content of the carboxylic acid ester group is 0.01-0.2% by mole based on a total amount of monomer units in the copolymer.

[Claim 2] The ethylene-vinyl alcohol copolymer according to claim 1 comprising;

a carboxylic acid group, a carboxylic acid salt group, or a lactone ring group at a polymer terminal,

wherein a content of the carboxylic acid ester group is 5-45% by mole based on a total amount of the carboxylic acid ester group, the carboxylic acid group, the carboxylic acid salt group, and the lactone ring group.

[Claim 3] The ethylene-vinyl alcohol copolymer according to any one of claims 1 to 2, wherein the carboxylic acid ester group is a carboxylic acid alkyl ester group.

[Claim 4] A process for producing the ethylene-vinyl alcohol copolymer according to any one of claims 1 to 3, comprising:

a step of copolymerizing ethylene and a vinyl ester monomer to obtain a copolymer and

a step of performing a saponification reaction in a nonaqueous system using a saponification catalyst,

wherein the step of performing the saponification reaction employs an alkali metal alkoxide as the saponification catalyst.

[Claim 5] The process for producing the ethylene-vinyl alcohol copolymer according to claim 4,

wherein the step of performing the saponification reaction is conducted in the presence of an alcohol solvent containing no water.