CLAIMS

1. A polymerization catalyst composition comprising:

a rare earth element carboxylate; and

a phosphate ester represented by the following general formula (1),

wherein the polymerization catalyst composition is obtained by a method comprising the following steps (a), (b) and (c):

a step (a) of adjusting a content of a phosphoric acid ester represented by the general formula (1) within a range of 0.01 to 20 eq relative to the rare earth element contained in the rare earth element carboxylate;

a step (b) of adjusting a content of water to 0.5 eq or less relative to the rare earth element contained in the rare earth element carboxylate at a reaction temperature of 80 to 160°C; and

a step (c) of adjusting a total content of free fatty acid and water to 0.6 eq or less relative to the rare earth element contained in the rare earth element carboxylate:

[Formula 1]

$$O{=}P(OR)_3 \qquad \cdots (1)$$

wherein Rs are each independently an alkyl group having 5 to 20 carbon atoms.

2. A polymerization catalyst composition comprising:

a rare earth element carboxylate; and

a phosphate ester represented by the following general formula (1), provided that a composition containing organoaluminum compound is excluded from the polymerization catalyst composition:

[Formula 1]

$$O{=}P(OR)_3 \qquad \cdots (1)$$

wherein Rs are each independently an alkyl group having 5 to 20 carbon atoms.

3. The polymerization catalyst composition according to claim 1 or 2, wherein the rare earth element carboxylate is a carboxylate containing one or more types of rare earth

elements selected from the group consisting of neodymium, gadolinium, praseodymium, lanthanum, samarium, and yttrium.

4. The polymerization catalyst composition according to any one of claims 1 to 3, wherein a content of the phosphoric acid ester is 0.01 to 20 eq relative to the rare earth element contained in the rare earth element carboxylate.

5. The polymerization catalyst composition according to any one of claims 1 to 4, wherein a content of water is 0.5 eq or less relative to the rare earth element contained in the rare earth element carboxylate.

6. The polymerization catalyst composition according to any one of claims 1 to 5, wherein a content of a free fatty acid is 0.1 eq or less relative to the rare earth element contained in the rare earth element carboxylate.

7. A method for producing a conjugated diene polymer, the method comprising polymerizing a conjugated diene monomer in presence of the polymerization catalyst composition according to any one of claims 1 to 6.