Summary of Invention

Technical Problem

[0004]

As disclosed in PTL 1, in order to suppress agglomeration in a CFB boiler, additives such as calcium carbonate and dolomite have been supplied to the combustion chamber. However, the mechanism and conditions under which agglomeration occurs in the CFB boiler have not been fully elucidated, and it has been difficult to appropriately determine the supply timing, the supply amount, the supply manner, and the like of additives.

[0005]

Embodiments of the present invention provide a combustion device and the like that can effectively suppress the occurrence of agglomeration.

Solution to Problem

[0006]

According to a first aspect of the present invention, there is provided a combustion device that supplies a fuel into a combustion chamber in which a fluid material containing silica flows and that combusts the fuel, the combustion device including: a combustion ash measurement unit that measures combustion ash generated by combustion in the combustion chamber; and a metal ratio estimation unit that estimates a ratio of an alkaline earth metal and/or an earth metal to an alkali metal in the combustion

chamber based on a measurement result of the combustion ash measurement unit.

[0007]

As will be described later, as a result of tests in an actual CFB boiler, it was found that the occurrence of agglomeration may be related to a ratio (hereinafter also referred to as a metal ratio) of alkaline earth metals (magnesium, calcium, and the like) and/or earth metals (aluminum and the like) to alkali metals (sodium, potassium, and the like) in the combustion chamber. Therefore, in the present aspect, the metal ratio in the combustion chamber is estimated based on the measurement result of the combustion ash generated by the combustion in the combustion chamber, thereby making it possible to effectively predict the occurrence of agglomeration.

[0008]

According to a second aspect of the present invention, there is provided a combustion method. The method is executed in a combustion device that supplies a fuel into a combustion chamber in which a fluid material containing silica flows and that combusts the fuel, and includes: a combustion ash measurement step of measuring combustion ash generated by combustion in the combustion chamber; and

a metal ratio estimation step of estimating a ratio of an alkaline earth metal and/or an earth metal to an alkali metal in the combustion chamber based on a measurement result of the combustion ash measurement step.

[0008a]

According to third aspect of the present invention, there is provided a combustion program causing a computer to execute the following steps in a combustion device that supplies a fuel into a combustion chamber in which a fluid material containing silica flows and that combusts the fuel, the steps including: a combustion ash measurement step of measuring combustion ash generated by combustion in the combustion chamber; and a metal ratio estimation step of estimating a ratio of an alkaline earth metal and/or an earth metal to an alkali metal in the combustion chamber based on a measurement result of the combustion ash measurement step.

[0009]

Any combination of the above components, or any expression of these components converted into methods, devices, systems, recording media, computer programs, or the like, are also included in the present invention.

Advantageous Effects of Invention

[0010]

According to embodiments of the present invention, the occurrence of agglomeration can be effectively suppressed.

Brief Description of Drawings

[0011]

Fig. 1 schematically illustrates a CFB boiler.

Fig. 2 is a state diagram of a eutectic system consisting of three types of components including silica derived from a fluid material, an alkali metal oxide (K_2O)