

ABSTRACT

There is provided a technique that includes: a reaction tube in which a process chamber configured to process a substrate is formed; a heater structure that is installed outside the reaction tube and includes a heater configured to heat the substrate; a cooler including a cooling valve configured to supply a cooling medium to a space between the heater structure and the reaction tube; an exhaust fan configured to supply the cooling medium to the cooler; and a cooling controller configured to: acquire a prediction model that includes information of the exhaust fan, a final target temperature that is a future target, and an opening state of the cooling valve and estimates a predicted temperature that predicts at least one selected from the group of a temperature of the heater and a temperature of the process chamber; acquire the at least one selected from the group of the temperature of the heater and the temperature of the process chamber, the opening state of the cooling valve, and the information of the exhaust fan; and regulate the opening state of the cooling valve to minimize an error between a predicted temperature column calculated according to the prediction model and a target temperature column calculated from a rate of change from a present target temperature to the final target temperature when the change occurs.~~Provided is a substrate processing apparatus including a cooling controller which acquires information about the temperature of a heater and/or the temperature of a process chamber, the opening state of a cooling valve, and an exhaust fan, and regulates the opening state of the cooling valve to minimize an error between a predicted temperature column calculated in accordance with a prediction model and a target temperature column calculated according to the rate of change from a current target temperature to a final target temperature.~~

Fig. 2