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Numerical Simulation of Flow and Heat Transfer Characteristics with Various Working Conditions inside a Reactor of Wet Scrubber

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Abstract : Recently, with the rapid growth of semiconductor industry, lots of interests have been focused on after treatment system that remove the polluted gas produced from semiconductor manufacturing process, and a wet scrubber is the one of the widely used system. When it comes to mechanism of removing the gas, the polluted gas is removed firstly by chemical reaction in a reactor part. After that, the polluted gas stream is brought into contact with the scrubbing liquid, by spraying it with the liquid. Effective design of the reactor part inside the wet scrubber is highly important since removal performance of the polluted gas in the reactor plays an important role in overall performance and stability. In the present study, a CFD (Computational Fluid Dynamics) analysis was performed to figure out the thermal and flow characteristics inside unit a reactor of wet scrubber. In order to verify the numerical result, temperature distribution of the numerical result at various monitoring points was compared to the experimental result. The average error rates (12~15%) between them was shown and the numerical result of temperature distribution was in good agreement with the experimental data. By using validated numerical method, the effect of the reactor geometry on heat transfer rate was also taken into consideration. Uniformity of temperature distribution was improved about 15%. Overall, the result of present study could be useful information to identify the fluid behavior and thermal performance for various scrubber systems. This project is supported by the 'R&D Center for the reduction of Non-CO_2 Greenhouse gases (RE201706054)' funded by the Korea Ministry of Environment (MOE) as the Global Top Environment R&D Program.

Keywords : semiconductor, polluted gas, CFD (Computational Fluid Dynamics), wet scrubber, reactor
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