ABSTRACT

The emissions of sulfur dioxide from various industrial sources, e.g., coal fired thermal power plants, petroleum refineries, fluidized bed catalytic cracking units, cement industries, smelters like copper, zinc and lead etc., always occur in association with particulate matters (e.g., flyash), in varying concentrations and quantities. Most of the times the concentrations of particulate laden sulfur dioxide in and around these plants overshoot the "danger point" of sulfur dioxide in conjunction with particulates for 24 hr [490,000 ($\mu g/m^3$) for 24 hr average]. The present investigation, therefore, deals with the abatement of particulate laden sulfur dioxide pollution, by scrubbing in a spray-cum-bubble column using water and dilute alkaline solutions to meet this stringent pollution control standard.

A spray-cum-bubble column has been developed, which can operate in both spray and bubble regimes. A two phase low pressure pneumatic nozzle that produces fairly uniform sprays of 40-140 μm, with velocities ranging from 10 to 30 m/s, has been incorporated as the spraying device.

Theoretical modeling and experimental studies have been conducted on the absorption of sulfur dioxide by water and dilute alkaline solutions of sodium hydroxide in the spray-cum-bubble column scrubber. Removal efficiencies due to water and alkaline scrubbing across the spray section of the hybrid scrubber have been theoretically predicted and compared with the experimental values.

Studies have been presented on the scrubbing of particulates (flyash) from air stream using water as the scrubbing medium.

Studies have also been presented on the scrubbing of particulate laden sulfur dioxide stream by using water and dilute alkaline solutions of sodium hydroxide in the spray-cum-bubble column scrubber. Removal efficiencies of sulfur dioxide attainable with water and alkaline scrubbing, in presence of particulates, have been theoretically predicted for the spray section and compared with the experimental values.

Key Words : abatement, absorption, air pollution, bubble, chemical reaction, droplet, flyash, gas-in-liquid dispersion, hybrid scrubber, impaction, impaction modified gas-liquid reaction, liquid-in-gas dispersion, particulate, particulate laden sulfur dioxide, scrubber, spray, spray-cum-bubble.