

A monitoring for consumption of CVD precursor

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We present a technique for monitoring the precursor consumption in a chemical vapor deposition (CVD) system.

CVD involves chemical reactions that transform gaseous precursors into a solid material in the form of thin film or powder on the surface of a substrate. Precursor costs are a significant factor, and therefore, methods for monitoring precursor consumption are desirable.

One diagnostic solution is to use an ultrasonic sensor to determine the precursor liquid level in the CVD containers(Fig.1). This method has advantages in being a noncontact and inexpensive method. It includes an ultrasonic sensor, an ultrasonic generator/receiver, and a computer system that includes an A/D board. The time between the sending of the ultrasonic signal and the return of an echo is used to determine the CVD precursor level in the container. The level of liquid (d) in the container is given by $d = v \cdot \{(1/2)t\}$ where v is the velocity of the ultrasonic pulse, and t is the time of flight of the ultrasonic pulse reflected from the surface of the liquid. We got the results obtained from a container with different liquid precursor levels (2, 4, and 6 cm).

Fig. 2 shows the accuracy and consistency of the measurements were within an acceptable tolerance range for the three liquid levels (Actual fill level : 2, 4, and 6 cm/Estimated fill level : 2.1, 3.8, and 5.9 cm) In summary, a sensor based on an ultrasonic technique has been developed for monitoring precursor consumption in an CVD system. The prototype sensors developed in this study are expected to be used successfully in semiconductor fabrication.

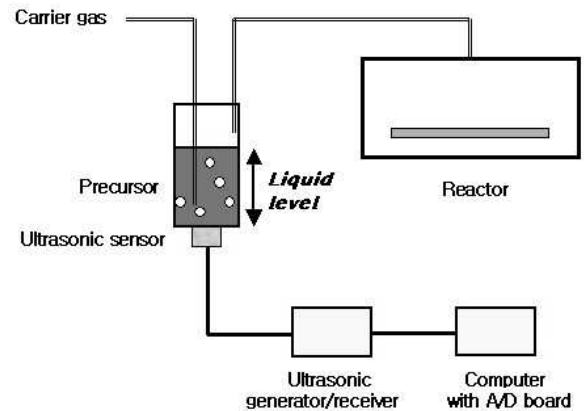


Fig.1 Schematic diagram of experimental arrangement including ultrasonic sensor for measuring precursor consumption in CVD system

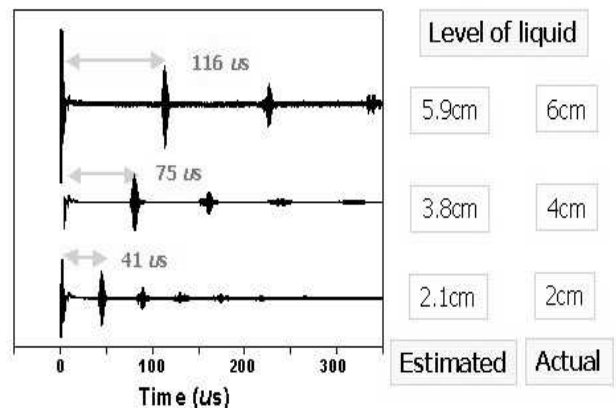


Fig.2 Comparison of estimated and actual liquid fill levels (Actual fill level : 2, 4, and 6 cm/Estimated fill level : 2.1, 3.8, and 5.9 cm)