

Characteristics of Core ICP Source for Solar Cell Deposition Equipment

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ABSTRACT

Now solar cell industry has required higher deposition rates and excellent uniformity for large area substrates while maintaining high quality because of lower production cost of solar cells. Recently, some researchers succeeded in achieving a high deposition rate of a-Si:H by increasing the frequency (VHF) of the RF power source, compared with that of 13.56MHz. But when the frequency of the RF power source is increased, a lot of electrical problems begin to appear, e.g. RF power matching problem and non-uniform plasma. Thus, the development of a new plasma source of large-area processing is one of the important topics in plasma applications.

In this presentation, we discuss about a ferrite core plasma source using low operating frequency. Compared with the conventional RF power system with high switching frequency, the proposed plasma power system is only operated at 400kHz, so that it makes possible to use of low cost switching elements, PWM control and soft switching. It could improve RF power matching problem and uniformity of plasma by using the ferrite core. With the strong self-coupling by the ferrite core and the formation of closed loop in inductive electric field, it could enhance the efficiency of plasma formation by inducing the strong electric field inside the plasma. The advantage of plasma generator using the ferrite core is better than the existing inductive coupling plasma with the respect of cost for the structure of plasma generator and efficiency of plasma. We report the experimental results of the dependence of the electron density and the electron temperature on the excitation frequency of 400kHz.

In this presentation, if the plasma generating method is applicable, it is expected that plasma shapes can be adjusted to characteristics of processes, and cheap and powerful deposition processing equipment can be developed accordingly. The brief introduction on the New Power Plasma will be given.