Abstracts

Resonance Characteristics of a Cavity-Operated Electrodeless High-Pressure Microwave Discharge System

S. Offermanns. "Resonance Characteristics of a Cavity-Operated Electrodeless High-Pressure Microwave Discharge System." 1990 Transactions on Microwave Theory and Techniques 38.7 (Jul. 1990 [T-MTT]): 904-911.

To characterize the resonance behavior of cavity-operated electrodeless high-pressure microwave discharge systems, a microwave circuit has been developed that allows high-power network analysis during the operation of the discharge. The frequency-dependent complex impedance of the cavity including the plasma is obtained from reflection measurement in the range 1.5-4.5 GHz. This method allows an observation of the actual resonance frequency and the actual vectorial mismatch so that a coupling efficiency > 99% can always achieved with proper adjustment of operation frequency and coupling probe. The experimental results with a cylindrical TM/sub 010/ cavity and coaxially situated discharge show a decrease of the resonance frequency with increasing power (increasing plasma temperature, electron density, electrical conductivity), depending on the discharge geometry and the plasma composition. In accordance with a simple one-dimensional model, the Q factor passes through a minimum at medium power levels, where the cavity discharge system absorbs the microwave energy most effectively.

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