Er_2O_3 COATING SYNTHESIZED WITH MOCVD PROCESS ON THE LARGE INTERIOR SURFACE OF THE METAL TUBE

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In an advanced liquid metal breeding blanket, Magneto-hydrodynamic (MHD) pressure drop is one of the key issues to apply to magnetic confinement fusion reactor systems. The electrical insulating coating on the blanket components such as duct and wall is an attractive concept for restraining of the MHD pressure drop. The other side, erbium oxide (Er_2O_3) was shown to be the promising candidate insulator coating because of its high stability in liquid lithium and high electrical resistivity from the results of Er_2O_3 bulk and Physical Vapor Deposition (PVD) thin film. Er_2O_3 is also known to be a one of the candidate materials for the tritium barrier coating. However, PVD coating technologies have limited capability in coating on complex surfaces expected in the blanket components. We have been investigated the Metal Organic Chemical Vapor Deposition (MOCVD) process for the oxide insulator coating. MOCVD has a vapor growth technique which is synthesized via vapor phase from metal organic complex and it will be used to fabricate complicated shape ducts and wall of breeding blanket components. Recently, we confirmed that single Er_2O_3 coating layers were synthesized on the surface of the metal and Si single substrates. From the results of the ICP mass analysis, the Er deposition rate of the $Er(IBPM)_3$ organic complex was increased four times compared with $Er(DPM)_3$ organic complex at 550℃. We found that the deposition quantity was able to be increased by using the $Er(IBPM)_3$ at lower temperature.

In this paper, we investigated to demonstrate Er_2O_3 coating on the large interior surface of the metal tube such as stainless steel by the vapor flow control operation. The effects of the synthesis conditions, such as temperature and environment, on Er_2O_3 coating through MOCVD process will be reported including characterization of microstructure and electrical properties.