

Electrochemical Studies on Ti/TiN Barrier Layer CMP

Venkatraman Chathapuram,¹ Kalpathy Sundaram,¹
Amarchand Sathyapalan,¹ Dnyanesh Tamboli² and
Vimal Desai¹

¹University of Central Florida
Advanced Materials Processing and Analysis Center
Orlando, FL 32816
USA

²Ashland Specialty Chemical Company
Ashland Inc.,
Dublin, OH 43017

In the Ti/TiN/W multilayer stack, tungsten serves as a plug while Ti/TiN serve as an adhesive/barrier layer. The focus of this paper is to understand the electrochemical parameters that control the polishing rates of Ti and TiN and contrast them with the W polishing. The effect of two oxidizers (5% H₂O₂ and 0.25 M KIO₃) at various pH (2 to 10) was studied through potentiodynamic polarization in alumina containing slurry. The removal behavior for both Ti and TiN appear to be controlled by electrochemical means, which shows increasing removal rates at higher current densities similar to a dissolution mechanism. This is in sharp contrast to the W removal mechanism in these slurries where the formation of WO₃ and its ability to form a soluble complex with the slurry determines the removal rate. The ability of single slurry to achieve 1:1 selectivity in CMP of a multilayer stack of Ti/TiN/W will be discussed based on electrochemical results.