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WITHDRAWN - Estimation of interdiffusion variables for tungsten - glassy carbon couples

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Estimation of interdiffusion variables for tungsten - glassy carbon couples

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ABSTRACT
Thin films have a wide applications in both electronic and nuclear industries. Many industrial processes, especially in the nuclear industry where the tasks of prolonging the lifespan of machine parts are of crucial interest, the roles of thin film in tribology are being exploited as superior alternative to conventional lubrication in liquid-base systems. In this study, thin films of tungsten (W) were deposited by DC magnetron sputtering on glassy carbon (GC) substrates. The as-deposited samples were annealed under vacuum at temperatures ranging from 200 to 1000 oC at various annealing durations. The mixing between W and GC atoms was investigated by Rutherford backscattering spectroscopy (RBS). RUMP and Data furnace programs were used to analyze the RBS spectra which revealed the thickness of W thin film deposited, atomic composition of deposited layer and as well as the reaction zones. Depth profiles obtained from the simulated results were used to estimate the interdiffusion coefficients of W–GC couples. From the interdiffusion coefficients obtained at the annealing temperatures between 700 and 1000 oC, where the interaction zones were well pronounced, the activation energy Ea and the pre-exponential factor Do were evaluated for the tungsten-glassy carbon diffusion couples; Ea is estimated to be 115 kJ/mol. while Do has a value of 1.1 x□10□^(-11) m2/s. Results of XRD, AFM, SEM and Raman complement each other well.

Keywords: tungsten, glassy carbon, interdiffusion, data furnace, RBS, RUMP

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