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Characterization, mechanical, and corrosion properties of chromium carbide films by using a 90∘bend magnetic filtered cathodic vacuum arc (FCVA) method CHIH-CHIANG WANG, CHUN-CHUN LIN, YA-CHYI CHEN, FUH-SHENG SHIEU, National Chung Hsing University, HAN C. SHIH, Chinese Culture University — The 90∘bend magnetic FCVA that equipped with the target of Cr (99.95%) and C_2H_2/Ar gas mixture deposited a high quality of chromium carbide films on the AISI D2 steel and Si wafer. The FCVA has been employed to eliminate the macroparticles during the film deposition. Various deposition temperatures of ambient temperature, 300, and 500° and negative substrate bias voltages ranging from -50 to -550V were applied. The microstructure of chromium carbide films was investigated by GIXRD and HRTEM. The atomic concentrations of C and Cr were measured by AES. The chemical bonding was elucidated by XPS, showing that the total C-Cr bond contents increased with increasing deposition temperature. As the substrate bias voltage increased from -50 to -550V, the phase transformed from amorphous to crystalline Cr_3C_2. The mechanical properties were evaluated by nanoindetation, nanoscratch, and scratch test. The surface roughness decreased from 2.05 to 0.34nm and the friction coefficient decreased from 0.28(amorphous) to 0.22(crystalline) as the substrate bias voltage increased from -50 to -550V. The corrosion resistance showed that the Cr_3C_2 coated steel had the noticeable increasing with the negative bias voltage up to -550V, and the pitting corrosion did not appear on the Cr_3C_2 coated steel.

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