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**Properties of $Cr_2AlC$ MAX phase thin films prepared by reactive magnetron sputtering** ZACHARY BUCK, TYLER DONATO, CHRISTOPHER ROTELLA, CARL LUNK, S.E. LOFLAND, J.D. HETTINGER, Department of Physics and Astronomy, Rowan University — $M_{n+1}AX_n$ (MAX) phases, where $n$ is 1, 2, and 3, M is an early transition metal, A is an A-group element, and X is either C or N, are ternary carbides with unique properties such as low density, easy machinability, and good oxidation resistance. The MAX phase $Cr_2AlC$ is of particular interest for industrial applications to its excellent high-temperature oxidation resistance and relatively low synthesis temperature. We prepared $Cr_2AlC$ thin films on c-axis oriented single crystal $Al_2O_3$, glassy carbon and Si thermal oxide substrates using reactive magnetron sputtering as precursor materials for carbide-derived carbon (CDC) films for "on-chip" supercapacitors. Film deposition was optimized using elemental composition data obtained by WDXRF. Optimized films were characterized using XRD and scanning electron microscopy. It was found that textured $Cr_2AlC$ films only form when the composition was Al-rich allowing the formation of a $Cr_5Al_8$ interfacial layer. As film composition was optimized, the interfacial layer did not form but the XRD peaks associated with the $Cr_2AlC$ also decreased in magnitude. Extremely high-textured films were grown when a thin buffer layer of $CrAl_2$ was deposited on the substrate before depositing the $Cr_2AlC$ films. This result suggests that $Cr_2AlC$ films may not be ideal for CDC applications since the films may "lift-off" during conversion due to the existence of the naturally occurring buffer-layer.

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