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Characterization and Mechanism Studies of Carbon incorporation into Al alloys[1] XIAOXIAO GE, CHRISTOPHER KLINGSHIRN, MANFRED WUTTIG, KAREN GASKELL, PETER ZAVALIJ, LOURDES-SALAMANCA RIBA, Univ of Maryland-College Park, BALU BALACHANDRANAN, Argonne National Laboratory, ARGONNE NATIONAL LABORATORY COLLABORATION, UNIVERSITY OF MARYLAND-COLLEGE PARK COLLABORATION — The incorporation of C nanostructures into Al alloys, such as Al 6061 and Al 1350, has the potential to further improve the mechanical, electrical and anti-corrosion properties of these alloys. We report on an electrocharging-assisted method to incorporate up to 10.0 wt.% C into the crystal structure of Al alloys to form a new material "Al Covetics". In this method, a DC current is applied to molten Al metal containing activated C particles. The current facilitates ionization of the C atoms followed by polymerization of the C structures and formation of graphitic chains and ribbons along preferred directions of the Al lattice. Raman mapping results indicate uniform C distribution over the surface in the Covetics. XPS carbon peak decompositions show *sp2* and *sp3* bonding from C structures and carbide bonding from Al-C bonds. TEM EELS spectra present a sharp C-K edge at 284eV, which further confirms the presence of *sp2* bonding in Covetics. The possible mechanism of Covetics conversion is similar to "electromigration in a plasma". The current attracts charged Al and C atoms and the reaction takes place. The dependence of the mechanical, electrical and structural properties of Al covetics on carbon content from 3 to 10 wt. % will be presented.

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