Corrosion Mitigation Approach by Coupling Laser Surface Alloying Experiments with Computer Simulations,

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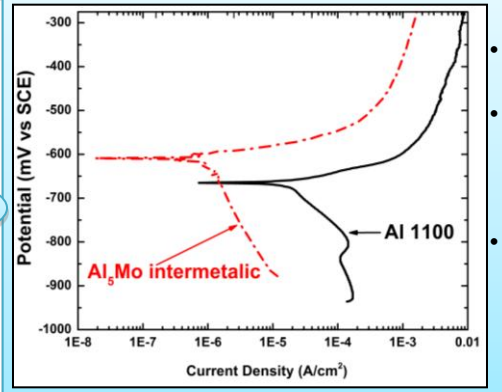
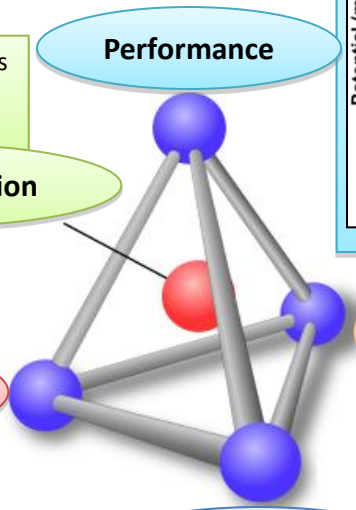
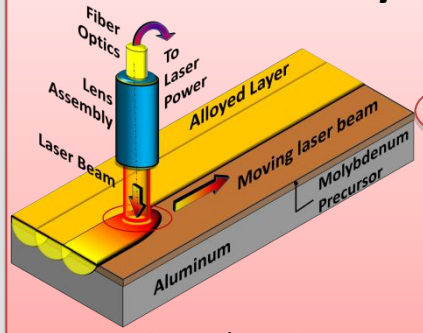
- Evaluate corrosion resistance via Electrochemical analysis
- Identify compositional and morphological variation in laser alloyed region by XRD, SEM, EDS



- Anodic polarization behavior in 0.01 m HCl solution at pH 2
- Enhancement of corrosion resistance is due to reduction in the cathodic current and low cathodic activity of Al_5Mo
- Presence of strong covalent bonding Al_5Mo and other intermetallics is preferable for corrosion conditions



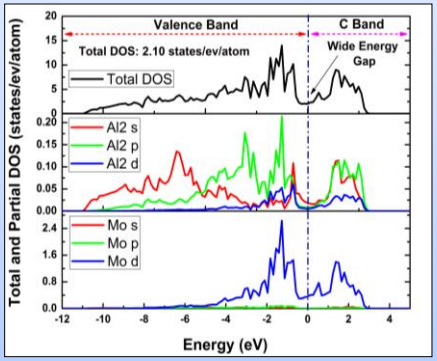
Laser Surface Alloying



- Processing under various laser conditions

Density Functional Theory (DFT)

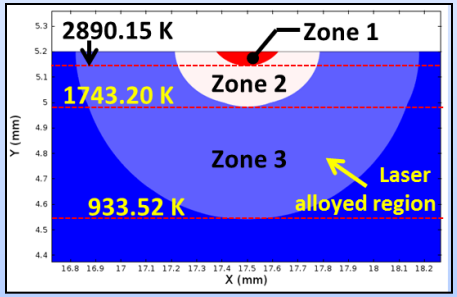
- Evaluate hybridization among the valence orbitals of Al_5Mo intermetallic



- Increase in corrosion resistance is correlated with the formation of covalent bonding via hybridization among Al (S, P) and Mo (d) orbitals.

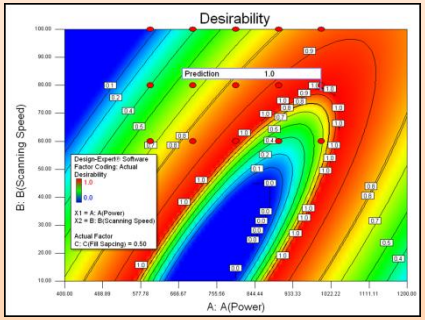
Finite-Element Modeling

- Evaluate dilution and concentration of Mo



- Dilution increases with the increase in laser power and decreases with the increase in scanning speed

- Al_5Mo (16.7 at. % Mo) intermetallic shows an improved corrosion resistive surface



- Investigate the effect of laser processing parameters (laser power, scanning speed, and fill spacing) on the Mo concentration in laser alloyed region
- Identify the significant processing parameters
- Analyze the experimental and modeling results and select desired level of dilution
- Quantify optimal laser processing parameters