

## Electrochemical and Mechanical Studies of Metal Parts Manufactured by CMT

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**Abstract** –An electrochemical study is carried out on metal parts manufactured by cold metal transfer (CMT) with ordinary steel under different working conditions (deposition speeds;  $V = 800, 1200$  and  $1600$  m/min and current density;  $I = 50, 75$  and  $100$  A) at a constant flow rate of inert gas  $Q_{\text{Argon/CO}_2} = 12$  litre/min. The samples were immersed in an aggressive environment ( $\text{H}_2\text{SO}_4$ ;  $0.5$  M). The electrochemical study was carried out using potentiodynamic polarization spectroscopy and impedance measurement. Morphological investigations carried out by scanning electron microscopy (SEM) confirm the electrochemical results. the deposition rate proportionally influences the polarization resistance with a rate equal to 60% and 43% for the metallic samples fabricated at current density  $I=100\text{A}$ , and  $I=75\text{A}$  respectively. The metallic samples fabricated at the current density  $I=75\text{A}$  have a good polarization resistance with a resistance rate equal to 54% compared to the metallic samples fabricated at  $I=100\text{A}$ , this confirms that the CMT process does not require great heat, on the other hand, it needs more cooling time, which is reflected in the deposition rate. Finally and to confirm the mechanical resistance on the parts manufactured in different working conditions, mechanical tests of pressure, attraction and shearing were carried out and gave us different results, which confirms the influence of its parameters on the mechanical resistance.

**Keywords** – CMT, Electrochemical, Steel, Current, SEM