

## *Abstract*

The Present work encompasses the effect of some additives of 1%wt ( $\text{TiO}_2$  &  $\text{ZrO}_2 \cdot \text{Y}_2\text{O}_3$ ) with a fixed amount of MgO about (0.1%wt) on microstructure and some mechanical properties of the eutectic Al-12%wt Si alloy.

The addition of 0.4%wt  $\text{TiO}_2$ , 0.6%wt  $\text{ZrO}_2 \cdot \text{Y}_2\text{O}_3$  and 0.1%wt of MgO had revealed the best modification compared with the other percentages of the mentioned additions, i.e. the hardness about (42.49 BH) with lower wear rate of ( $7.5 \cdot 10^{-9} \text{ cm}^3 \cdot \text{cm}^{-1}$ ) and a maximum value of impact resistance of ( $0.053 \text{ J/mm}^2$ ) with tensile strength about (100 MPa).

Also the research studies the effect of adding 2%wt of ( $\text{CaCl}_2$  &  $\text{CaF}_2$ ) or  $\text{CaF}_2$  alone on grain refinement of the eutectic Al-Si alloy. It was found that the addition of ( $\text{CaCl}_2$  &  $\text{CaF}_2$ ) had refined the eutectic phase in the Al-12%wt Si alloy and revealed lower wear rate i.e. ( $6 \cdot 10^{-9} \text{ cm}^3 \cdot \text{cm}^{-1}$ ) and hardness was (39.70 BH).

Furthermore, the maximum value occurred in the impact resistance by adding 2 %wt of  $\text{CaF}_2$  with  $\text{CaCl}_2$  to the molten eutectic Al-Si alloy, i.e. ( $0.0516 \text{ J/mm}^2$ ) and ultimate tensile strength of (117 MPa).