

Parallel Magnetic Field Effect on Copper Cementation onto Rotating Iron Rod

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Abstract : The rate of copper cementation on iron rod was investigated. The study was mainly dedicated to illustrate the effect of application of electromagnetic field (EMF) on the rate of cementation. The magnetic flux was placed parallel to the iron rod and different magnetic field strength was studied. The results showed that without EMF, the rate of mass transfer was correlated by the equation: $Sh = 1.36 Re^{0.098} Sc^{0.33}$. The application of EMF enhanced the time required to reach high percentage copper cementation by 50%. The rate of mass transfer was correlated by the equation: $Sh = 2.29 Re^{0.95} Sc^{0.33}$, with applying EMF. This work illustrates that the enhancement of copper recovery in presence of EMF is due to the induced motion of Fe^{+n} in the solution which is limited in the range of rod rotation speed of 300~900 rpm. The calculation of power consumption of EMF showed that although the application of EMF partially reduced the cementation time, the reduction of power consumption due to utilization of magnetic field is comparable to the increase in power consumed by introducing magnetic field of 2462 A T/m.

Keywords : copper cementation, electromagnetic field, copper ions, iron cylinder

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