RECOVERY OF PRECIOUS METALS FROM SCRAP INTEGRATED CIRCUITS

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ABSTRACT

THE GENERATION OF SCRAP INTEGRATED CIRCUIT (IC) INCREASES RAPIDLY, AS THE MODERN SOCIETY DEPENDS ON THE HIGH TECHNOLOGY ELECTRONIC DEVICES MORE AND MORE. SCRAP INTEGRATED CIRCUIT (IC) CONTAINS VARIOUS HEAVY METALS (FE, AL, PB, ZN, CU, NI, ETC.) AND PRECIOUS METALS (AU, AG, ETC.). THESE METALS MAY SERIOUSLY POLLUTE THE ENVIRONMENT, IF THEY ARE NOT PROPERLY DISPOSAL. IN ORDER TO MINIMIZE THE POLLUTION PROBLEM AND TO CONSERVE THE LIMITED NATURAL RESOURCES, A HYDROMETALLURGICAL PROCEDURE IS DEVELOPED IN THIS STUDY TO RECOVER THOSE METALS CONTAINED IN THE SCRAP IC. IN THIS STUDY, SEVERAL METHODS OF ROASTING, GRINDING, SCREENING, LEACHING, CEMENTATION, SOLVENT EXTRACTION AND ELECTROLYTIC WINNING ARE ADOPTED TO INVESTIGATE THE RECOVERY EFFICIENCY OF GOLD, SILVER AND COPPER OF SCRAP IC. THE RESULT OF THIS STUDY REVEALS THAT MOST OF THE METALS HAVE A BIGGER PARTICLE SIZE WHICH CAN BE SEPARATED AND RECOVERED BY USING THE ROASTING, GRINDING AND SCREENING METHODS. AFTER SCREENING, THE GOLD, SILVER, AND COPPER CONTAINED IN THE FINE MATERIAL (-50 MESH) CAN BE RECOVERED BY THIOUREA LEACHING AND CEMENTATION WITH COPPER POWDER. THIS STUDY SHOWS THAT THE BEST OPERATING CONDITION OF THIOUREA LEACHING IS THE ADDITION OF 2 G THIOUREA, 3.6 N H2SO4 , 2.6 G IRON(Ⅲ) SULFATE WITH A LEACHING TIME OF 7 HOURS AT AMBIENT TEMPERATURE. THE OPTIMUM CONDITION OF CEMENTATION IS THE ADDITION OF 2G OF COPPER POWDER FOR ONE HOUR OPERATION. IN ORDER TO PREDICT THE RECOVERY (R) OF GOLD BY THIOUREA LEACHING, A SEMI-EMPIRICAL MODEL WAS DEVELOPED ON THE BASIS OF FIVE OPERATING PARAMETERS (I.E., THIOUREA CONCENTRATION (U), H2SO4 CONCENTRATION (S), IRON(Ⅲ) SULFATE CONCENTRATION (F), LEACHING TIME (T) AND LEACHING TEMPERATURE (T)) AND A NON-LINEAR REGRESSION TECHNIQUE. THE FINAL EXPRESSION OF THIS MODEL IS OBTAINED BELOW: R=0.174 × U 0.356 × S 0.196 × F 0.078 × T 0.077 × T 0.01

Keywords : INTEGRATED CIRCUIT, RECOVERY, RECYCLING, GOLD, SILVER, HYDROMETALLURGY

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