



“Gheorghe Asachi” Technical University of Iasi, Romania



RECOVERY OF SILICON, COPPER AND ALUMINUM FROM SCRAP SILICON WAFERS BY LEACHING AND PRECIPITATION

Ching-Hwa Lee¹, Ying-Wen Chang^{1*}, Srinivasa R. Popuri², Chi-En Hung¹,
Ching-Hua Liao¹, Juu-En Chang³, Wei-Sheng Chen⁴

¹*Department of Environmental Engineering, Da-Yeh University, Changhua, Taiwan, 515 R.O.C.*

²*Department of Biological & Chemical Sciences, The University of the West Indies, Cave Hill Campus, Barbados-11000*

³*Department of Environmental Engineering, National Cheng Kung University, Tainan, Taiwan, 701 R.O.C.*

⁴*Sustainable Environment Research Laboratory, National Cheng Kung University, Tainan, Taiwan, 701 R.O.C.*

Abstract

The Silicon wafer plays an important role in modern electronic products. During the production of Silicon wafer, a large amount of scrap Silicon wafer is generated. The necessity for it to be recycled and recovered is of vast importance since the metal Silicon (Si) is the major by product. Besides Silicon, the wafers also contain a small quantity of Copper (Cu) and Aluminum (Al), that are considered as minor elements during the recovery process of the Silicon wafer production. Therefore, in order to conserve limited natural resources, minimize pollution problems and recover the valuable resource of Silicon from scrap wafer, a leaching method was adopted in this study. Physical and chemical methods such as screening and leaching processes were employed to investigate the recovery of Silicon and other metals from scrap wafers. The leaching process was carried out with three leaching reagents such as HCl, HNO₃ and H₂SO₄. Batch studies were also conducted to optimize the leaching operating conditions with consideration to the leaching time, the concentration of leaching reagent, temperature and solid/liquid ratio. The result of the leaching tests revealed that the Copper and Aluminum contained in the scrap wafers can be 100% leached and removed by using 5N HNO₃ under the conditions of two hours leaching time, 5g/50 mL of solid/liquid ratio, and 70°C temperatures. After leaching with Nitric acid, a high purity of Silicon was obtained and could be reused as the feed material for the production of Silicon wafer. The Copper and Aluminum remaining in the leaching solution was recovered through precipitation by adjusting its' pH to 11 and 7 to form Cu (OH)₂ and Al(OH)₃, respectively.

Key words: aluminum, copper, recover, scrap, silicon, wafer

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* Author to whom all correspondence should be addressed: e-mail: yingwchang@gmail.com; Phone: +886 917025240; Fax: +886 48511338