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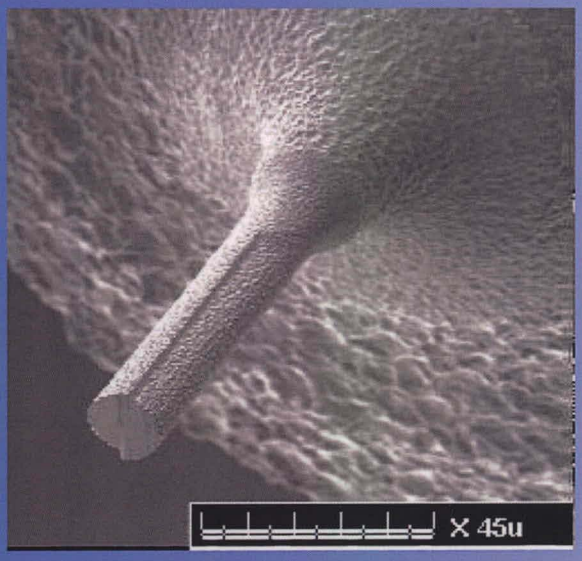

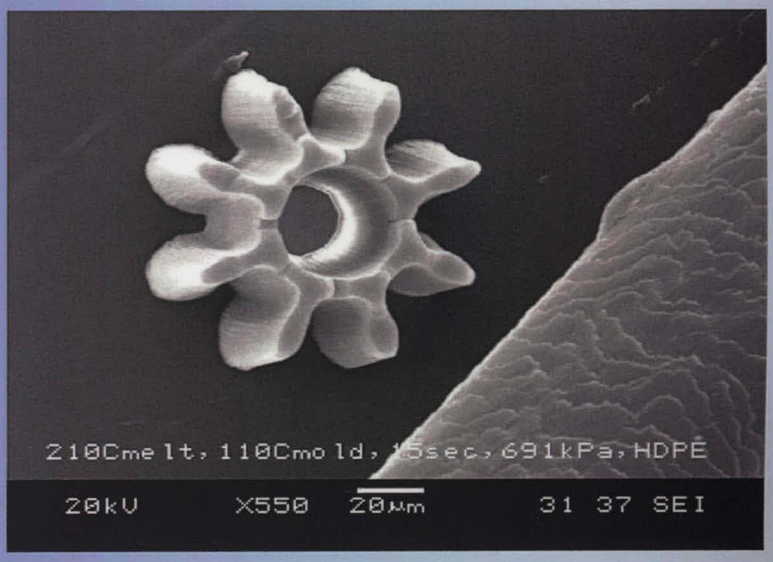

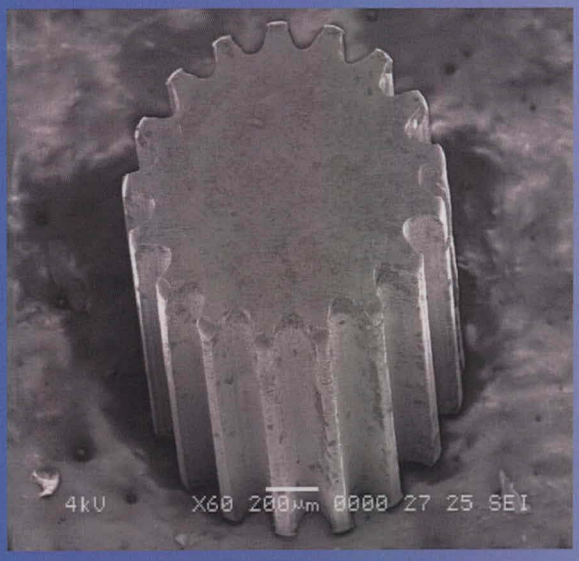

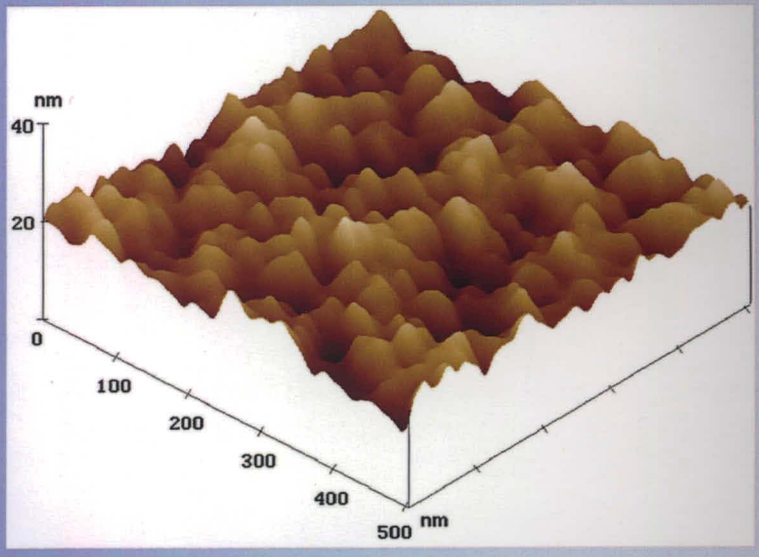

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Chapter 29

Fabrication of Micro Filter by Electro Discharge Machining

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Keywords: Micro Filter, Electro discharge machining, Micro hole

Abstract. Water purification becomes more urgent because of the reduction in the reserves of high quality pure water in the world. There are many methods that are used for elimination of organic and inorganic components from water. But micro parts filtration is more easier and cost effective way of removing specific impurities like particles, suspended solids, protozoa, cysts and bacteria (bigger size). Micro filters can be made by different manufacturing processes like micro electro discharge machining (micro-EDM), laser beam machining (LBM), water jet machining (WJM), focused ion beam (FIB), LIGA (Lithography, Electroplating, and Molding), and ultrasonic machining. Micro holes on copper substrate were fabricated by micro-EDM process in the manufacturing lab of IIUM. The objective of the experiment was to investigate the capability of handling the micromachining specially micro-EDM in the practical usage. The machining procedure is discussed in this chapter, including the design of the device and coding for machining.

Introduction

Micro filters are used to eliminate sand particles, suspended solids, protozoa, cysts and bacteria (bigger size) from water. The filter contains several micro holes to trap these particles and pass the purified water. Ceramics and copper are used for producing water filter for their inherent physical and chemical properties like corrosion resistance and resistance to abrasion. micro-electro discharge machining (micro-EDM) is one of the nonconventional machining processes by which micro holes can be created easily. It is an electro-thermal machining process, where electrical energy is used to generate electrical spark. Material removal mainly occurs due to thermal energy of the spark. A series of rapid, repetitive and randomly distributed electrical sparks or discharges occur within a constant spark gap between tool and workpiece. The workpiece is placed in a dielectric medium. The sparks cause the ionization of dielectric medium at a critical voltage and establish an ionized channel, which acts as the heat source causing melting and vaporization of the workpiece [2,3]. Micro-EDM has been established as a powerful process in industrial machining. Its high flexibility with respect to workpiece geometry and material is a distinguishing advantage of the process [4]. Micro-EDM can be applied for processing of any conductive material. Nonconductive materials can also be machined with the assistance of conductive material. This process does not involve any mechanical energy and material removal rate (MRR) generally is not influenced by the hardness and toughness of the workpiece. This chapter investigates the possibility of micro hole fabrication in copper substrate by micro-EDM. Copper is used for experimentation because it has following properties.