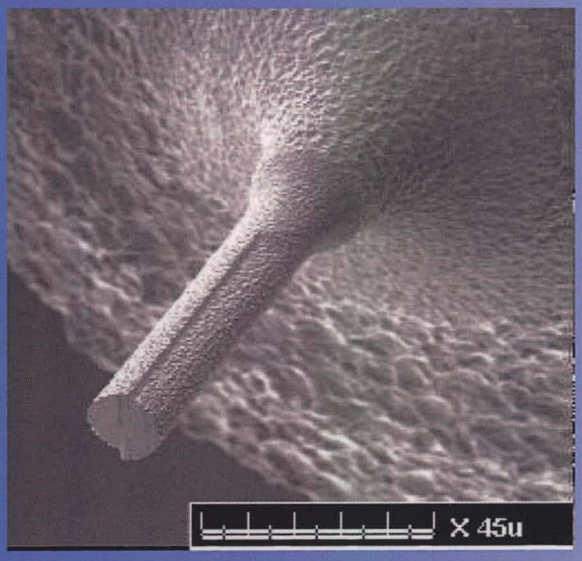
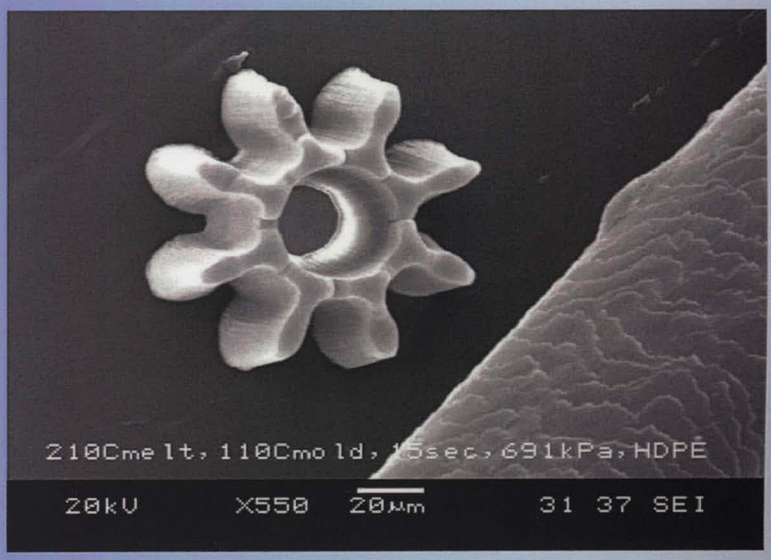
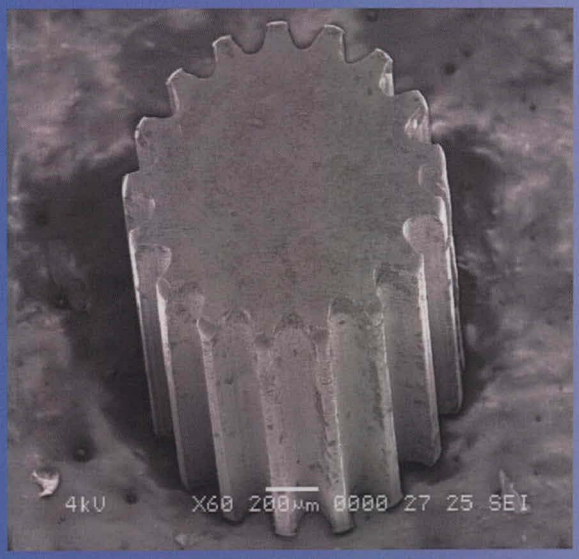
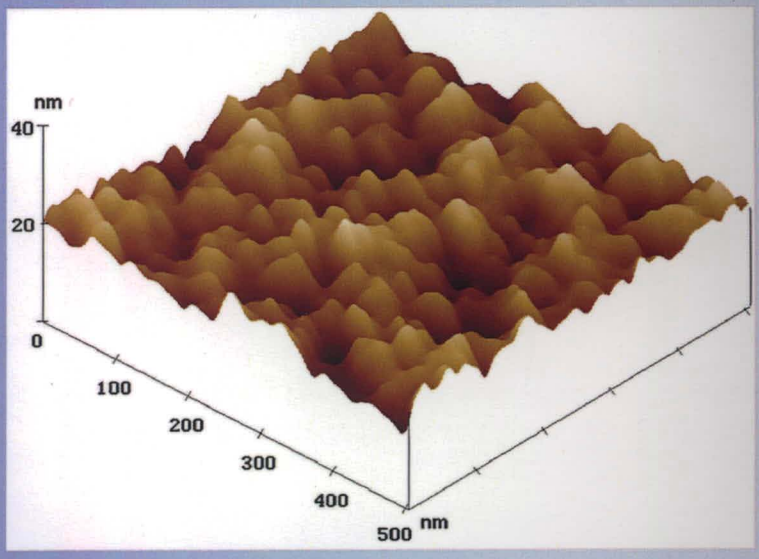
# Advanced Machining Process

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**Mohammad Yeakub Ali**
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# Advanced Machining Process

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Chapter 8

# Machining of Ceramic Materials: A Review

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**Keywords:** Ceramics, Laser beam machining, Electro discharge machining.

**Abstract.** The use of ceramics in industrial and engineering applications is increasing rapidly due to its extraordinary properties like high hardness, law thermal conductivity, resistance to oxidation. Machining operations for fabricating ceramic parts are difficult and most of the traditional machining techniques are not suitable to process ceramic materials. Conventional machining process like diamond grinding can be used for finishing operation. Nonconventional techniques like electro discharge machining, laser beam machining, ultrasonic machining are now frequently used for producing new parts and components from ceramics. Researchers are still trying to develop the appropriate machining conditions for processing ceramic materials. In this chapter, general properties of ceramics, problems associated with the machining, the machining techniques to process ceramic materials into useful products and some relative advantages and disadvantages of the machining processes are discussed in short.

## Introduction

Ceramics are composed of metallic and non-metallic elements. The covalent and ionic bonds of elements make the ceramics much stronger than metals. The word "ceramic" comes from the Greek word *keramikos* means clay products or from *keramos means* potter's clay [1]. The most primitive use of ceramics was in pottery objects. They were made either from clay itself or mixed with other materials, hardened in fire. Later ceramics were glazed and fired to create a coloured, smooth surface. Ceramics have been used for many years in automotive spark plugs as an electrical insulator and for high temperature strength. Ceramics now include domestic, industrial and building products and art objects. Examples include cutting tools, self-lubricating bearings, turbine blades, internal combustion engines, heat exchangers, ballistic armour, ceramic composite automotive brakes, diesel particulate filters, a wide variety of prosthetic products, piezo-ceramic sensors. [1,5].

## General Properties of Ceramics

It is a solid material prepared from its ingredients by heat and subsequent cooling. Ceramic have crystalline or partly crystalline structure. Sometimes it may be amorphous (e.g., a glass). But most common ceramics are crystalline. Ceramics have some excellent chemical and physical properties that have made it very attractive to the manufacturers. The properties are: