HIGHER TECHNICAL INSTITUTE
MECHANICAL ENGINEERING COURSE

DIPLOMA PROJECT

DEVELOPMENT OF MANOMETER SCALE ENGINEERING POWDER COMPONENTS BY CONTROLLING THEIR MICROSTRUCTURE

M/955

BY
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HIGHER TECHNICAL INSTITUTE

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CONTENT

ABSTRACT

The trend to smaller and smaller structure, that is, miniaturization, is well known in the manufacturing and microelectronics industries, as evidenced by the rapid increase in computing power through reduction on chips of the area and volume needed per transistor (Roher 1993). In the materials area this same trend towards miniaturization also is occurring, but for different reasons. Smallness itself is not the goal. Instead, it is the realization, or now possibly even the expectation, those new properties intrinsic to novel structures will enable breakthroughs in a multitude of technologically important areas (Siegel 1991; Gleiter 1989).

Of particular interest to scientists is the fact that nanostructures have higher surface areas than do conventional materials. The impact of nanostructure on the properties of high surface area materials is an area of increasing importance to understanding, creating, and improving materials for diverse applications. High surface areas can be attained either by fabrications small particles or clusters where the surface-to-volume ratio of each particle is high, or by creating materials where the void surface area (pores) is high compared to the amount of bulk support material. Materials such as highly dispersed supported metal catalysts and gas phase clusters fall into the former category, and microporous (nanometer-pored) materials such as zoelites, high surface area inorganic oxides, porous carbons, and amorphous silicas fall into latter category.