A CONTRIBUTION TO SOME PHENOMENOLOGICAL RELATIONS IN CRYSTALLINE POWDER COMPACT SINTERING

by

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INTRODUCTION

Phenomenological analysis of the sintering process is one of the approaches to studies of sintering. There is quite a number of phenomenological theories by which the physical processes occurring in the porous system during the sintering process may be explained and described more or less successfully (1). As it is a fact that geometric changes also inevitably go along with sintering, while masses of independent particles are converted into coherent bodies, there has been numerous attempts to find out (establish) some geometric models on which the sintering process would be studied. These attempts, however, failed in achieving the results desired, as the limitations of Euclide's geometry led to simplified models that are too unreal. Namely, powder particles rarely have regular forms and they are never simply distributed, and that's why they are moving, in relation of one to another, in a stochastic way. For that reason, especially recently, there have been a definite tendency towards a topology and rheology approach to the sintering process (2, 3).

In our paper we have considered two interesting problems, both from the phenomenological and from physical aspects of the contemporary sintering theory. They are, first, sintering activation energy and its relation with material structure state, and, second, possibility of correlation of grain sizes and pore sizes with density in the intermediate and final stages of sintering.

1. SINTERING ACTIVATION ENERGY

Sintering activation energy is a kinetic parameter that has been most frequently determined, on the basis of which the identification of mass-transfer mechanisms during the sintering process has been done. Bearing in mind the complex nature of the sintering process, where there have been clearly indicated simultaneous and succes-