# MODELING BINDER BURNOUT

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Thermal decomposition products of polymeric binders which are removed from the ceramic-binder mixture (the so-called green body) pose serious problems during binder burnout process by initiating such defects in powder compacts as voids, blisters, cracks, bubbles and residual carbon. The purpose of this research is to acquire a fundamental knowledge about the mechanism by which above mentioned defects are produced. The binder burnout model is proposed at first wherein all the possible problems will be taken into consideration. Computer simulations conducted here focused on void growth within the molten polymer regions in the interstices between packed ceramic particles as a part of series of studies to simulate the whole binder burnout process. A void would result if a gas or vapor bubble grows larger than the interstitial site in which it is found, and exerts enough internal pressure to distort the surrounding particle arrangement. Monomer vapor bubble nuclei may form during rapid polymer decomposition, and solvent and air bubbles may be generated during the ceramic forming process. The bubbles grow as decomposition products diffuse into them from non-ceramic phases. Computer-calculated bubble growth rates were obtained in this study. A number of parameters are known to be important to binder removal. These are: 1)process parameters such as heating rate, pressure and atmosphere, 2)physical and chemical and thermal properties of binders such as glass transition temperature, melting point, decomposition temperature and reactivity, viscosity and surface tension, and 3)properties of ceramic green body such as binder to polymer ratio, pore and particle size distribution, relative density, wettability, surface chemistry and distribution of the binder. The influences of some material properties and operational parameters on various bubble growth phenomena were also investigated.