FEATURES OF REACTING SINTERING OF COMPOSITIONS CONTAINING REFRACTORY INERT COMPONENTS

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Reacting sintering with liquid phase is of particular practical interest in relation to problems of obtaining dense powder materials, especially for structural purpose. In systems with an intermediate compound very active interaction occurs at contact melting, including the dissolution of the refractory component in the eutectic or peritectic liquid and synthesis.

An increase of the samples is generally observed on unipolar dissolving of a solid component in the liquid. An active shrinkage comes about under conditions where the liquid state reacting system is in the thermokinetic oscillation mode [1]. This behavior can not be realized in any system due to differences in their control of physicochemical parameters [2]. Furthermore, the nature of the formation of the macroscopic pore at the self sharpening step of the reaction process is not clear. It was assumed that they are formed as a result of the coagulation of fine pores formed by dissolution of the refractory component in liquid.

A reacting system on the basis of nickel and 67,5% Sn is selected as a model composition. Sintering of the samples over a wide range of temperatures accompanied an increase of the samples under prolonged exposure (Fig. 1).

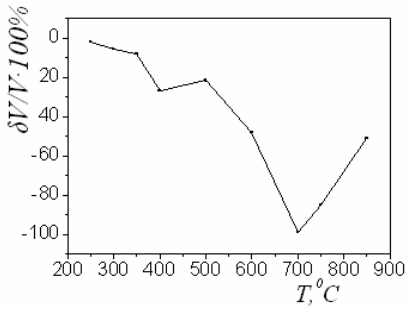
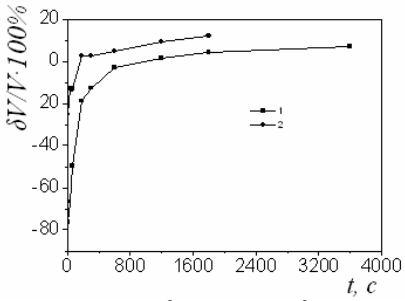


Fig.1 Temperature dependence of volume changes for Ni-67,5% Sn green samples at sintering during 1200 s

Probably the coagulation of small pores formed by unipolar dissolution of nickel in liquid tin follows by reaction of the intermetallic compound synthesis in the self sharpening mode.

This leads to macroscopic flow of the liquid and coagulation of pores to the cavities. Localization and deceleration of flows are possible by introducing the fine inert solid wetting agent.

Indeed, the introduction of calcium fluoride in the initial period does not affect the growth of patterns, but quickly gives way to shrink the growth and that, in fact, indicates the deletion of the mechanism of cavity growth due to the coalescence of smaller pores (Fig. 2).



1 - 850 ^{0}C; 2 - 925 ^{0}C

Fig.2 Kinetics of sintering (Ni-67,5Sn) - - 25 % vol. CaF_2 samples

These results demonstrate another approach to the creation of programmed reacting sintering technology.

1.Солнцев В.П., Скороход В.В, Солнцева Т.А Коллективные процессы при реакционном спекании с участием жидкой фазы // Порошковая металлургия, 2010.- №3/4.- С. 22 - 29.

2.Солнцев В.П., Скороход В.В. Термокинетическая модель и механизм реакционного взаимодействия, инициированного перитектическим плавлением // Доп. НАНУ- 2009 - №11 - С. 91-97.