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Discontinuous Al-SiC Composites Formed by a Low Cost Chemically Activated Infiltration Technique

Pridobivanje in kemijska infiltracija poroznih SiC vzorcev z Al-Si talino

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In this work, the preparation of porous SiC preforms from SiC particles, platelets and whiskers have been demonstarted. Near net shape preforms, prepared by vacuum casting, were sintered and then covered by SiO_2 layer using a cost effective oxidation in air at 1175 K for 10h. Surface engineered SiC preforms were than pressureless infiltrated in nitrogen atmosphere (96 vol% N_2 + 4 vol% Ar) by a Al-Si melt containing 0.5 - 3 wt% Mg. Based on this, a mathematical model of spontaneous infiltration of a porous ceramic preform has been suggested. The role of magnesium and nitrogen atmosphere was quantitatively evaluated among the other important processing parameters (porosity of preform, the specific surface area, etc.) collected in a new term named preform infiltrability. Moreover, the influence of the above listed parameters on the infiltration rate (expressed as infiltration length and function of time) has also been demonstrated. The optimal conditions for spontaneous and cost effective pressureless infiltration of porous SiC preforms by molten aluminium alloy has been selected and experimentaly confirmed.

Key words: porous SiC preforms, vacuum casting, pressureless infiltration, infiltration kinetics, infiltrability of porous preforms

V delu je opisana izdelava poroznih SiC vzorcev z vakuumskim vlivanjem in njihovo sintranje do poroznih predoblik, sestavljenih iz SiC delcev različne oblike: okrogli, heksagonalne ploščice in kratka vlakna. Z oksidacijo na zraku smo prevlekli površino poroznih SiC predoblik s tanko plastjo SiO_2 in izboljšali omočljivost med SiC in Al talino. V nadaljnjem delu smo infiltrirali porozne keramične vzorce z Al-Si-Mg talino v dušikovi atmosferi (96 vol% N_2 + 4 vol% Ar) pri normalnem tlaku. Na podlagi pridobljenih rezultatov smo razvili matematični model infiltracije, ki opisuje kinetiko procesa v funkciji poroznosti in specifične površine pripravljenih poroznih vzorcev, vsebnosti dušika v atmosferi in sestave Al zlitine. Model je osnova za nadaljnji razvoj tehnologije priprave Al-SiC kompozitov s spontano oz. nizkotlačno infiltracijo poroznih SiC vzorcev.

Ključne besede: porozne SiC predoblike, vakuumsko vlivanje, spontana infiltracija, kinetika infiltracije, infiltrabilnost poroznih predoblik

1 Introduction

The need for high strength, lightweight, and high stiffness materials has, in recent years, attracted much interest to the development of the manufacturing processes of metal matrix composites (MMCs)[1]. The most important limitation of the fabrication of MMCs by liquid-phase processes resides in the compatibility between the reinforcement and the matrix[2]. This compatibility is particularly important in the case of aluminium-based composites, because Al is usually covered with a thin oxide layer that prevents wetting, and when uncovered, it readily reacts with most ceramics to form intermetalics. In particular, liquid aluminium reacts with SiC to produce aluminium carbide and free silicon. Wettability and reactivity determine the quality of the bond between both materials and, therefore, greatly influence the final properties of the composite.

In many instances the properties of a reinforced metal have been shown to provide a performance advantage over a monolithic metal, but the high cost of producing the composite has prohibited widespread commercial use. Liquid-metal processes have the potential to be more economical; hovever, the non-wetting nature of many ceramics by molten aluminium, which results in poor ceramic/metal interfaces and incomplete infiltration, has been an obstacle.

Melt infiltration is a popular technique for fabricating MMCs, as it allow near-net shape fabrication of components and material with a high reinforcing phase content. The molten metal may penetrate the porous preforms either under the action of an external force (pressure casting[3] and vacuum assisted liquid infiltration process[4]) or through a capillary pressure which is created once the molten metal wets the ceramic surface (pressureless infiltration[5]).

Several pressure casting methods have been used for preparing MMCs. The operating principle of a hydrostatic pressure infiltration device[6] is to use pressurised gas to force molten metal into an evacuated die. Another pressure casting technique is relatively simple[7]: pre-heating the particle aggregate in a special mould and then adding 3 MPa pressure to the molten metal poured on the particle aggregate so as to encourage penetration which results in a metal-particle composite. Recently, a bottom mixing process has also been suggested, where an evacuated packed bed in the bottom of a crucible is covered with a melt, and than stirrer shears the interface between the particles and the melt, resulting in incorporation[8].

Different fabrication methods using vacuum techniques for cast-in-place hardfacing of casting were also described[9]. In these processes, aluminium poured into a sand mould is drawn by vacuum into a porous layer of

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reinforcing phase (named - preform) placed on a wall of the mould cavity.

A recent molten metal process is the Lanxide Corp. Primex^{TM} pressureless infiltration process[10,11]. In this process a packed bed of ceramic powder is infiltrated by an Al-Mg alloy, without any applied pressure, in a nitrogen atmosphere. The resulting composite, which has a packed bed density of about 55 vol.-%, can than be diluted in the appropriate matrix alloy. Ceramic particles of SiC and Al_2O_3, with particle size as fine as about 1 μm have been infiltrated in this way, and at infiltration rates of up to the order of centimetres per minute under specific processing conditions. Processing details of the Primex^{TM} route are proprietary, but it would appear to be a very competitive process for higher volume fraction composites. The Lanxide Corporation has made extensive efforts to protect this very valuable technology and has well over 100 U.S. patents and over 1500 foreign patents pending, with nearly 50 U.S. patents and over 100 foreign patents being issued or allowed by the middle of 1989.

In this work, the preparation of porous SiC preforms made by SiC particles, platelets and whiskers have been demonstrated. The surface of SiC preforms has been covered by SiO_2 layer using cost effective oxidation in air. Chemically treated preforms were than pressurelless infiltrated by an Al-Mg alloy in nitrogen atmosphere. The conditions for spontaneous (as used, spontaneously means without the aid of any externally applied pressure or vacuum), pressureless infiltration, which include the use of a magnesium containing alloy and a nitrogenous atmosphere have been already well documented in literature, by the inventors[12]. However, the offered explanation is semi-empirical based on the well known role of magnesium which decreases the surface tension of a molten aluminium alloy. As stated by inventors[12], this alone does not induce spontaneous infiltration, but a nitrogen atmosphere may cause a further reduction in the surface tension, thus promoting wetting. Additionally, the reactivity of magnesium induces interfacial reactions with solid ceramic surfaces. These reactions typically are not sufficient to promote spontaneous wetting, but again in combination with a nitrogen atmosphere they may change or be altered, thus allowing the observed infiltration. These results clearly demonstrated that the combination of magnesium in the alloy and a nitrogeneous atmosphere leads to the spontaneous infiltration of aluminium alloy into ceramic fillers. However, little information is available on the effect of a nitrogen atmosphere on wetting. Some authors[13] found that when fabricating aluminium alloy matrix composites via compocasting, the use of a nitrogen atmosphere and a bubble-degassing step with nitrogen yielded composites with much lower porosity than those produced similarly with argon, but these results may not be assciated with enhanced wetting.

In the present paper a mathematical model of spontaneous infiltration of a porous ceramic preform has been suggested. The role of magnesium and nitrogenous atmosphere was quantitatively evaluated among the important processing parameters (porosity of the preform, the specific surface area, surface tension and the contact angle). Moreover, the influence of above listed parameters on the infiltration rate (expressed by the infiltration length as a function of time) has been also demonstrated. In this way, the optimal conditions for spontaneous and cost effective pressureless infiltration of porous SiC preforms by molten aluminium alloy were selected and experimentaly confirmed.

2 Pressureless infiltration - theoretical considerations

A. Capilllary Law

Spontaneous infiltration of a liquid into a porous medium takes place when the liquid wets the solid. Otherwise, a minimum external pressure should be applied. This threshold pressure P (also called capillary pressure) is related to the contact angle θ and the particle size through the so-called capillary law or Laplace equation:

$$P = 6\lambda\gamma_{lv} \cos\theta\, V_p/((1-V_p)D) \qquad (1)$$

where γ_{lv} is the liquid-vapor surface tension, λ a factor which depends on the geometry of the particles, D the mean diameter of the particles, and V_p the particulate volume fraction. Note that product ($-\gamma_{lv}\cos\theta$) is the work of immersion W_i defined as the change in the free energy on immersing the solid in the liquid. The work of immersion can be written in terms of the threshold (or capillary) pressure through the following expression:

$$W_i = P\,(1-V_p)/S_s\rho V_p \qquad (2)$$

where S_s is the specific surface area (the surface area per unit mass of porous preform) and ρ is the density of the particulate. Unfortunately, the Laplace equation describes the situation for a cylindrical tube, a very crude model for the types of porous media under consideration here. This model, for example, cannot be applied to irregularly shaped pores where the effect of both pore geometry and network cooperatively combine with contact angle hysteresis[14]. However, White[15] derived a specialized expression based on the Laplace equation relating the pressure, P required to prevent capillary rise in porous media for which the specific surface area S_s, solid density ρ, surface tension γ_{lv}, contact angle θ, and porosity α, are known:

$$P = (1-\varepsilon)\,\rho\, S_s\gamma_{lv} \cos\theta\,/\varepsilon \qquad (3)$$

B. Darcy's Law

The flow of an incompressible fluid through a porous medium is governed by Darcy's law[16]. For unidirectional flaw, and neglecting any effect of gravity, Darcy's law can be written as

$$v_o = - (k/\mu)\,(dP/dx) \qquad (4)$$

where v_0 is the superficial velocity of the fluid (the velocity of the fluid as measured by the volumetric flow rate per unit cross sectional area where the cross section is taken perpendicular to the average direction of flow), μ the viscosity of the liquid, dP/dx the pressure gradient at the infiltration front, and k the intrinsic permeability. It has been found empirically that the intrinsic permeability k of a porous medium is proportional to the square of the mean particulate diameter[17]

$$k = aD^2 \qquad (5)$$

where the constant a must be determined experimentally.

The superficial velocity v_0 can be related to the actual velocity in the porous medium (dx/dt) by means of the particulate volume fraction V_p:

$$v_o = (1-V_p)\,dx/dt \qquad (6)$$

Combining Eqs. (4) and (6) and integrating, the expression for the infiltration length, L as a function of time and the pressure drop in the liquid metal #9P can be written as:

$$L = [2kt\Delta P/\mu(1-V_p)]^{1/2} \qquad (7)$$

On the other hand, for pressureless infiltration the pressure drop should be at least equal to the threshold (or capillary) pressure (Eq. 3). Under conditions of constant permeability and constant capillary pressure, Eqs. (3) and (7) can be combined to obtain the following relationship between infiltration length L, time t, and other processing parameters:

$$L = (1/\varepsilon)\,[2ktW_iS_s\rho(1-\varepsilon)/\mu]^{1/2} \qquad (8)$$

Note that W_i (work of immersion) is equal - $\gamma_{lv}\cos\theta$.

The Eq. (8) can be simplified introducing that

$\varepsilon^{-1}\sqrt{2kS_s\rho(1-\varepsilon)}$ is the infiltrability of porous preform Q:

$$L = Q\,[W_i/\mu]^{1/2}t^{1/2} \qquad (9)$$

Again, it's important to note that Eq. (9) is valid under conditions of constant infiltrability and porosity of ceramic filler, constant work of immersion and, finally, constant viscosity of the melt, which is very difficult to obtain in practice.

In spite of this considerable limitation, Eq. (9) can be successfully used in combination with Eq. (3) in order to designe the simple mathematical criterion for an early stage of pressureless infiltration of porous ceramic preform. Moreover, using this procedure, the parameters of pressureless infiltration can be selected to satisfied both proceeing requirements: spontaneous infiltration at acceprtable infiltration rate.

3 Materials and experimental procedures

Preparation of porous SiC preforms

For the purpose of this study, three basic SiC morphologies - particles, platelets and whiskers in several size ranges (**Table 1**) were used for preforms preparation. Photomicrographs of used powders are compared in **Fig. 1**. A diagram outlining the preform production process is shown in **Fig. 2**.

Table 1: Characteristics of SiC phases used

	Particles	Platelets	Whiskers
	HSC 1200 Microgrits Superior Graphite	SiC Platelets Millenium Materials, Inc.	M-Grade SiC_w Advanced Refractory Technologies, Inc.
Chemistry:	Stoichiometric SiC	Stoichiometric SiC	Stoichiometric SiC
Crystalographic Structure:	Primary phase Beta	Primary phase Beta	Primary phase Beta
Diameter range (µm):	2-12	35-40	whisker length 15-20
Thickness (µm):	/	3-5	1-2
Aspect ratio:	/	8-10	10-12
Purity:	97-99 wt% SiC	<1000 ppm of metallic impurities	<1000 ppm of metallic impurities
Particulate Content (%):	~100	5-10	5-10
Oxygen (%) by Leco	1.0	0.68	1.1
Free Carbon(%):	1.0	0.01	0.53
Specific Gravity (g/cm^3):	3.21	3.21	3.21

Preform infiltration

The experimental lay-up used in this work consisted of an aluminium alloy ingot, measuring about ϕ50 x 30 mm, placed on the top of a porous ceramic preform. The filler material had a height that was great enough to prevent full infiltration under the process conditions (i.e. more-or-less infinite column of filler material). After processing, the amount of infiltration (distance from alloy/filler interface) was measured, and the composite was sectioned and examined both macro- and microstructurally. The alloy/filler pairs were than placed into a controlled atmosphere furnace within a refractory vessel (a 99.9% sintered alumina). The furnace was evacuated to ~1 Pa at room temperature and back-filled with an nitrogen-containing atmosphere until a positive flow was obtained. Note that all experiments were conducted under a slight positive pressure that was achieved by bubbling the exit gas through a 25 mm column of oil. Following the procedure developed in Lanxide, the furnace was ramped to temperature at a rate of 200°C/h, held at temperature for the specified time (e.g. at 800-1000°C for 10 to 24 h for full infiltration of the speciments) and allowed to cool to 675°C, at which time the samples were removed from the furnace and cooled to room temperature. Various combinations of magnesium-containing aluminium alloys, silicon carbide porous preforms, nitrogen-containing gases, and temperature/time conditions were employed to study the effect of various process variables on the infiltration kinetics.

Because the infiltration of the porous preforms occurs in a nitrogenous atmosphere (at least about 10 volume percent nitrogen and the balance a non-oxidizing gas under the process conditions), aluminium nitride precipitates may form within the aluminium alloy matrix.

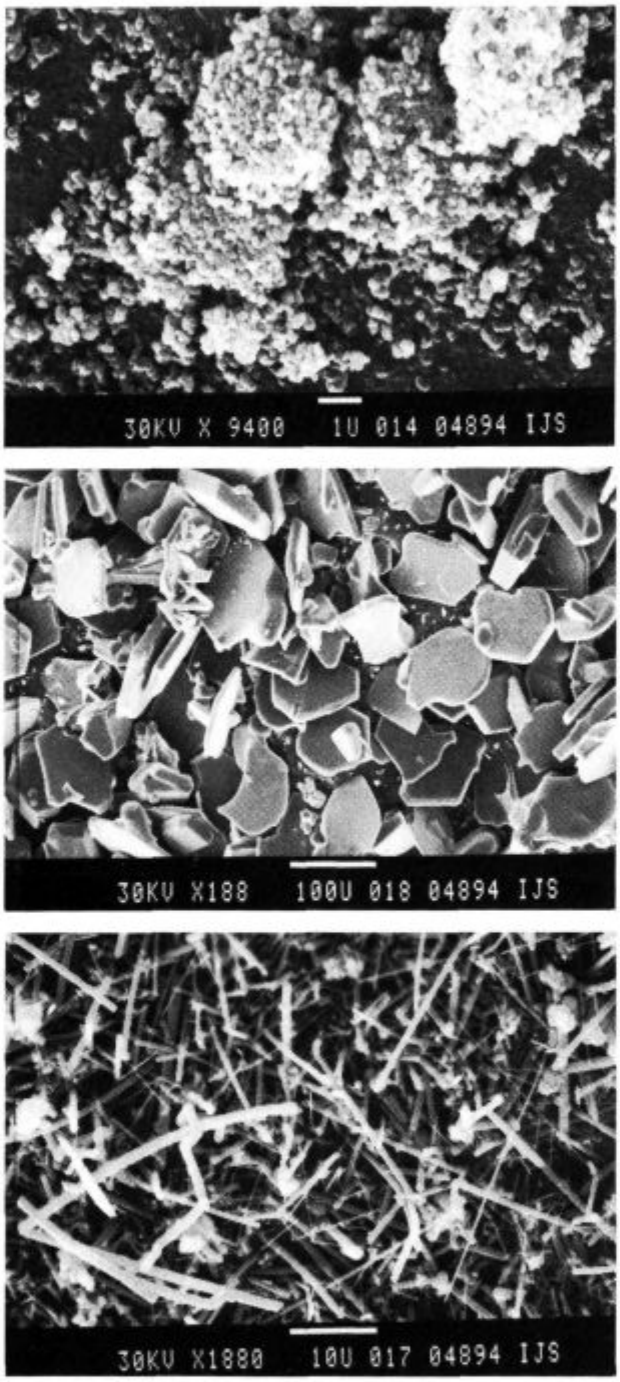


Figure 1: Photomicrographs of used SiC morphologies: a) HSC 1200 Microgrits Superior Graphite, b) SiC Platelets, Millenium Materials, Inc. and c) M-Grade SiC whiskers, Advanced Refractory Technologies, Inc.

Slika 1: SEM fotografije SiC uporabljenih delcev: a) SiC prah -HSC 1200 Microgrits Superior Graphite, b) SiC ploščice, Millenium Materials, Inc. in c) SiC whiskerji - M-Grade, Advanced Refractory Technologies, Inc.

The per cent weight gain provides a measure of the amount of aluminium nitride that forms during processing. For comparison, the total conversion of pure aluminium to aluminium nitride produces a weight gain of 52%. Moreover, because this experimental arrangement produced a constant volume of composite in all cases where full infiltration occured, the weight gains of different experiments could be directly compared.

4 Results and discussion

Preform preparation

SiC preforms, containing whiskers, platelets or particles, were fabricated by vacuum casting in a variety of shapes and with a uniform microstructure. The characteristics of these preforms are listed in **Table 2**.

Table 2: Characteristics of SiC- whiskers, platelets and particles preforms made by vacuum casting method

CHARACTERISTIC	PREFORM		
	Particle's grade	Platelet's grade	Whisker's grade
Average bulk density (g/cm^3)	1-2.25	1-2.25	1-2.25
Preform diameter (cm)	3-10	3-10	3-10
Preform height (cm)	2-5	2-5	2-5
BET-Specific surface area (m^2/g)	1.5-5.9	2.0-2.5	3.5-3.8
Porosity (vol%)	30-70	30-70	30-70

Infiltration experiments

The critical process conditions for pressureless infiltration of porous SiC preforms with molten aluminium

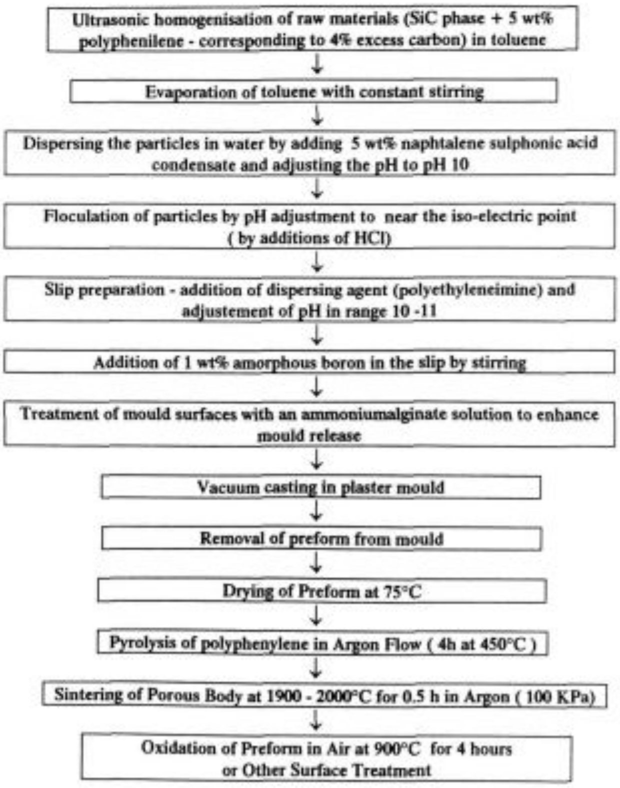


Figure 2: Preform fabrication process

Slika 2: Proces pridobivanja poroznih predoblik

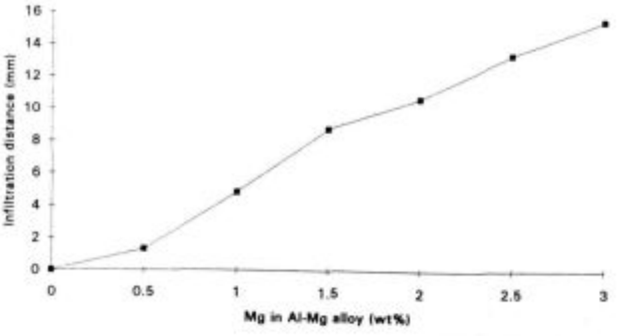


Figure 3: Relationship between magnesium content in an Al-10Si-Mg alloy and inilltration distance (process conditions - 5 h dwell at 1175 K, nitrogen atmosphere with 4 vol% Ar) measured in SiC particle grade preform

Slika 3: Odvisnost globine infiltracije od vsebnosti magnezija v Al-10Si-Mg zlitini (eksperimentalni pogoji - 5 h pri 1175 K, atmosfera dušika s 4 vol% Ar) za porozne SiC predoblike pripravljene iz SiC prahu

alloys were found to be: (i) the alloy composition, (ii) the atmosphere composition, (iii) the process temperature and time and (iv) the infiltrability of the preforms.

The influenece of alloy composition (specifically the magnesium content) on infiltration distance is plotted in **Fig. 3**. The collected results are in agreement with data previously reported by Aghajanian et al.[12] The new data also confirm the linear relationship between magnesium content and amount of infiltration proposed by Aghajanian et al.[12].

The effect of nitrogen content of the atmosphere on the infiltration process was determined by conducting experiments in atmospheres ranging from 100% N_2 to 100% Ar. It was found that no infiltration occured in 100% Ar, only partial infiltration occured in 10% N_2+90% Ar and full infiltration occured when the nitrogen content exceeded 20-30 vol%. As reported[11], at high percentages of N_2, where infiltration was rapid, little nitride formed, whereas in dilute atmospheres, where infiltration was slow, observable levels of AlN formed. In a similar fashion, the process temperature significantly affects the quantity of nitride that forms within the aluminium alloy matrix. **Figure 4** plots unit weight gain versus process temperature for samples using alloy Al-10Si-3Mg, preforms made by SiC grit and process conditions of a 5 hour dwell at temperature in 95% N_2/4% Ar. Results also demonstrate that increased process temperature results in increased nitride formaton whichincrease becames significant and nearly linear for temperatures higher than 1125 K.

At a constant magnesium level and a fixed nitrogen content, several others process variables can affect the infiltration behaviuor. **Fig. 5** plots the infiltration distance against temperature for otherwise constant process conditions. It is evident that infiltration increased in an approximatively linear manner with the temperature. Additionally, the data show that there is a threshold temperature required to initiate the pressureless infiltration for a given set of process parameters. Although limited, the data presented in **Fig. 6** suggest that the threshold temperature changes with the process conditions (the preform infiltrability, the alloy composition and the nitrogen content in the processing atmosphere).

One can also conclude that the process temperature affects the quantity of AlN that formed within the aluminium alloy matrix. **Fig. 7** plots the unit weight gain against temperature for different SiC grade preforms. The results demonstrate that as the process temperature increases, the quantity of AlN that forms also increases. These results are in well agreement with reported data[12] and confirm that the increase in AlN content is approximately exponential over the temperature range investigated.

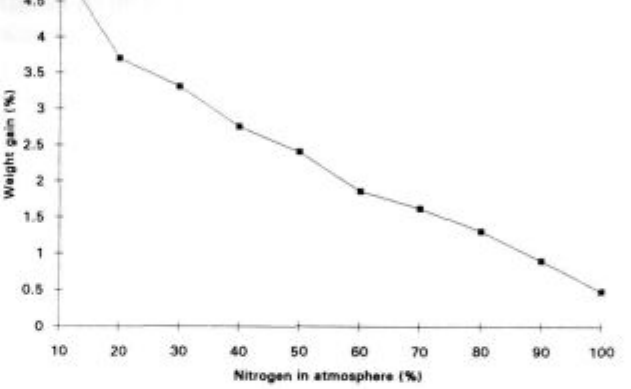


Figure 4: Dependance of unit weight gain on the content of nitrogen in N_2/Ar atmosphere (Al-10Si-3Mg alloy, SiC particle grade preform, 5 h soak at 1075 K)

Slika 4: Odvisnost povečanja teže vzorcev od vsebnosti dušika v N_2/Ar atmosferi (zlitina Al-10Si-3Mg, predoblike pripravljene iz SiC prahu, 5 h pri 1075 K)

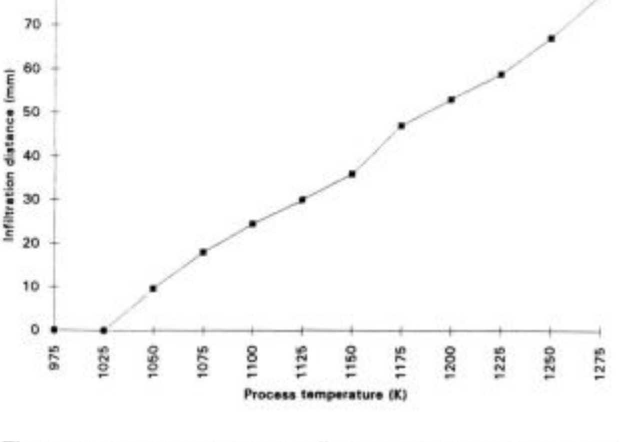
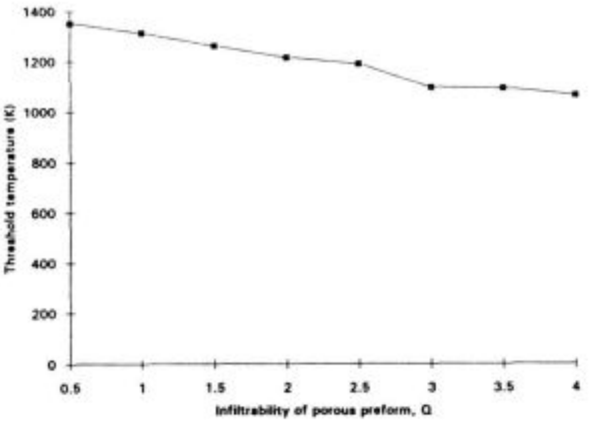
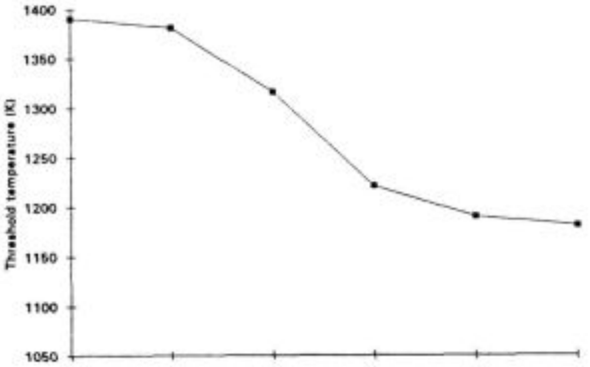


Figure 5: Variation of infiltration distance with process temperature (Al-10Si-3Mg alloy, SiC particle grade preform, 5 h soak at temperature in a nitrogen atmosphere with 4 vol% Ar)

Slika 5: Odvisnost globine infiltracije od temperature (zlitina Al-10Si-3Mg, predoblike pripravljene iz SiC prahu, 5 h pri delovni temperaturi v dušikovi atmosferi s 4 vol% Ar)





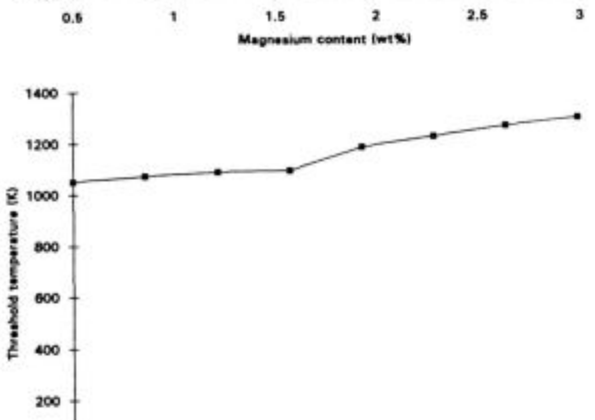


Figure 6a: Relationship between threshold temperature and infiltrability of porous SiC particle grade preforms (Al-10Si-3Mg alloy and a 5 h soak at temperature in nitrogen atmosphere with 4 vol% Ar)

Slika 6a: Odvisnost temperature začetka infiltracije od infiltrabilnosti poroznih predoblik, pripravljenih iz SiC prahu (zlitina Al-10Si-3Mg, 5 h pri delovni temperaturi v dušikovi atmosferi s 4 vol% Ar)

Figure 6b: Relationship between threshold temperature and magnesium content in Al-10Si alloy (SiC particle grade preform and a 5 h soak at temperature in nitrogen atmosphere with 4 vol% Ar)

Slika 6b: Odvisnost temperaturnega praga od vsebnosti magnezija v Al-10Si zlitini (predoblike pripravljene iz SiC prahu, 5 h pri delovni temperaturi v dušikovi atmosferi s 4 vol% Ar)

Figure 6c: Relationship between threshold temperature and nitrogen in processing atmosphere (Al-10Si-3Mg alloy, SiC particle grade preforms and a 5 h soak time at 1125 K)

Slika 6c: Odvisnost temperaturnega praga za porozne predoblike pripravljene iz SiC prahu, od vsebnosti dušika v delovni atmosferi (zlitina Al-10Si-3Mg, 5 h pri delovni temperaturi)

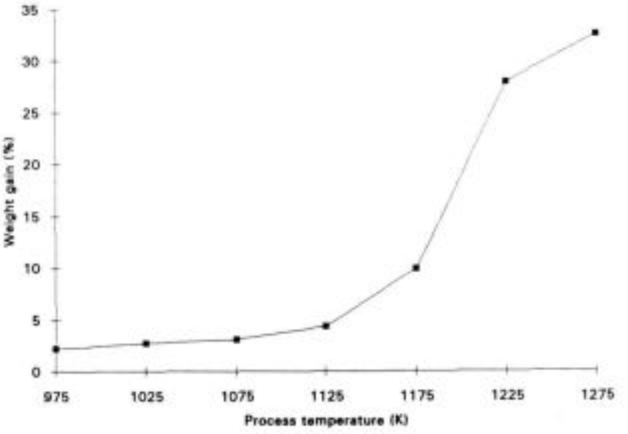


Figure 7: Relationship between process temperature and AlN formation (unit weight gain) in aluminium alloy matrix (obtained using alloy Al-10Si-3Mg, SiC particle grade preform and a 5 h soak at temperature in nitrogen atmosphere with 4 vol% Ar)

Slika 7: Odvisnost temperature infiltracije od deleža nastalega AlN (izraženega kot povečanje teže analiziranih vzorcev) v Al zlitini (zlitina Al-10Si-3Mg, predoblike pripravljene iz SiC prahu, 5 h pri delovni temperaturi v dušikovi atmosferi s 4 vol% Ar)

The effect of the infiltrability of porous preforms (see Eq. (9)) on the infiltration process was studied using preforms with different porosity and specific surface area. Note that the preform infiltrability, defined as $\alpha^{-1}\alpha 2kS_s\rho(1-\alpha)$, could be expressed as a function of specific surface area (S_s) and porosity (α) taking into account Eq. (5):

$$Q = \text{const. } \varepsilon^{-1}S_s\sqrt{\rho}(1-\varepsilon) \qquad (10)$$

Fig. 8 plots the infiltration distance against preform infiltrability. The changes in the infiltrability of porous preforms were obtained by ranging their porosity and specific surface area. In order to meet these requirements, the preforms were prepared using selected sintering conditions. The results demonstrate that all experimental data fit well with the proposed process kinetics expressed by Eq. (9) for otherwise constant process conditions. Moreover, Eq. (9) seems to be valid for very different morphology of SiC particles.

However, the Eq. (9) also, in some matter, presents a serious problem. There is a very complex correlation between preform porosity and its real specific surface area. Usually, BET technique is used to determine S_s. It should be noted, however, that a method based upon gas adsorption at the surface whose area is to be measured may not provide the right value to be inserted in Eq.(9). In fact, as reported[14], the specific surface area relevant in the wetting of particulates by aluminium could be much lower than that given by the BET technique.

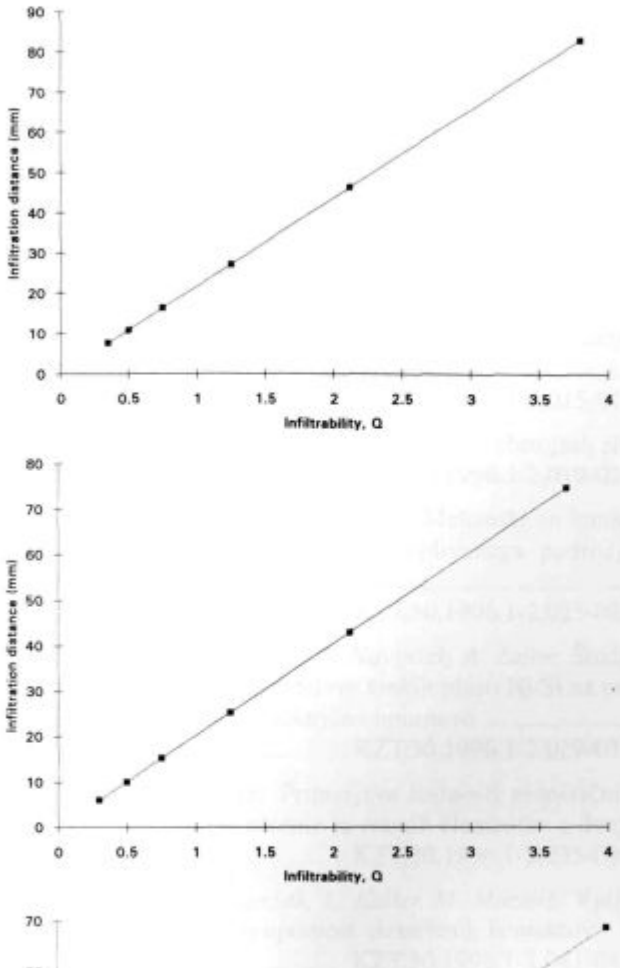


Figure 8: Dependence of infiltration distance on infiltrability of different porous preforms (Al-10Si-3Mg alloy, a 5 h soak at 1175 K a nitrogen atmosphere with 4 vol% Ar) for - a) SiC particle grade preform, b) SiC platelets grade preform, and c) SiC whisker grade preform

Slika 8: Odvisnost globine infiltracije od infiltrabilnosti poroznih predoblik, pridobljenih iz: a) SiC prahu, b) SiC ploščic in c) SiC whiskerjev (zlitina Al-10Si-3Mg, 5 h pri 1175 K, dušikova atmosfera s 4 vol% Ar)

5 Concluding remarks

A process for the production of porous SiC preforms consisting particles, platelets or whiskers is reported. It involves the vacuum casting of specialy prepared slip and sintering of green body to the porous specimen. Following this procedure, vacuum cast preforms in a variety of sizes, with high dimensional and compositional reproducibility, and with uniform characteristics were fabricated.

Porous preforms were sucessfully pressureless infiltrated using the Primex^{TM} method originaly developed by Lanxide, Inc.

The results presented in this article demonstrate that the combination of magnesium in the Al alloy, the nitrogeneous processing atmosphere (with at least 25 vol% N_2) and several porous preform characteristics (specifically the porosity and specific surface area) summarised in term preform infiltrability leads to the pressureless infiltration of molten aluminium alloy into ceramic filler.

The collected data have confirmed that no infiltration occured without the correct combination of above listed process variables. This means that the magnesium content in Al alloy and the content of nitrogen in processing atmosphere should be combined with correctly designed porous preform characteristics.

The results of present work demonstrate the infuence of preform porosity and its specific surface area on the infiltration length. The infiltration kinetics were shown to be strongly affected by preform infiltrability for otherwise constant process conditions. In addition to kinetics, it was found that experimental data fit well the proposed expression for the infiltration length as a function of preform infiltrability, work of adhesion, viscosity of the melt and processing time. Moreover, the experimental results demonstated that the suggested equation is operative for the different morphology of SiC particulate used in this work. However, the influence of preform surface composition, which should affectsthe work of adhesion, and the viscosity of the melt is matter of the further experimental efforts.

6 Acknowledgements

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