In-situ observations of high-pressure, high-temperature infiltration processes in SiC-metal systems were performed using MAX80 cubic anvil press at the station. SiC-Zn and SiC-Al nanocomposites were synthesized using SiC powder composed of monocrystalline-nanoparticles (Fig.1). The characteristics of SiC nanopowder is presented in Tab. 1 The processes proceeded as follow: (1) material setup was pressed at room temperature, (2) heated up to desired temperature, (3) cooled down to the room temperature, and finally (4) unloaded.

![Fig. 1. TEM picture of SiC nanopowder used in the experiments](image)

**Fig. 1. TEM picture of SiC nanopowder used in the experiments**

During synthesis processes X-Ray diffraction patterns were collected in different temperatures. The time duration of the diffraction data collection for each temperature was 1 min. We examined the effect of temperature on microstrains by tracing changes of FWHM of SiC Bragg reflections of (111) for SiC-aluminiu and (220) for SiC-zinc systems. The values of FWHM, relative to initial state FWHM₀ (p=0, RT) as a function of temperature are presented in Fig.2.

![Fig. 2. The effect of temperature on FWHM of SiC peaks relative to initial state](image)

**Fig. 2. The effect of temperature on FWHM of SiC peaks relative to initial state: (220) for SiC-Al system and (111) for SiC-Al system**

<table>
<thead>
<tr>
<th>Tab.1. Powder characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal size [nm]</td>
</tr>
<tr>
<td>Specific Surface Area [m²/g]</td>
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</table>
FWHM analysis

a. At the first stage of the processes, a rigid ceramic matrix of SiC is formed under pressure at room temperature. In the consequence strong microstrains are generated between SiC nanoparticles, what is demonstrated by a significant peak broadening and FWHM increase (see initial state – point 1).

b. The significant decrease of the FWHM is observed in SiC-Zn system (see points 1-12). In Si-Al system only slight decrease is observed (see point 1-18).

c. After processes FWHM values are the same under pressure (points 12 and 18) and after unloading (see points material after process).

Results

1. In result of the infiltration we obtained SiC-Zn composite with the grains of both phases in the nano-scale (Fig. 3).

![Fig. 3. SiC-Zn nanocomposite obtained using infiltration process](image)

2. In SiC-Al system the infiltration was not successful. We obtained one phase SiC ceramic with small amount of aluminium carbide (Fig. 4).

![Fig. 4. Diffraction pattern of the SiC-Al sample after process](image)

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