Oxidation behavior of SiC fiber reinforced SiC-Ti_3SiC_2 matrix composite at high temperature

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Research Article

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Abstract

Three different SiCf/SiC-Ti3SiC2 composites were prepared by slurry impregnation pyrolysis and reactive melt infiltration. The oxidation behavior of the composites at 1300 °C from 2h to100h was studied. These samples were examined by using scanning electron microscopy, energy dispersive X-ray spectrometry and X-ray diffraction analysis. Then, three-point bending and nano indentation test were carried out to investigate the mechanical performance of the composites with and without oxidization. The results revealed that the Max phase Ti3SiC2 can improve the strength and toughness of the composites. After oxidation at 1300 °C, Max phase still existed in the matrix, and the strength highest retention rate of the material was 83%. Furthermore, the possible oxidation mechanism was proposed on the basis of the results.

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Figures

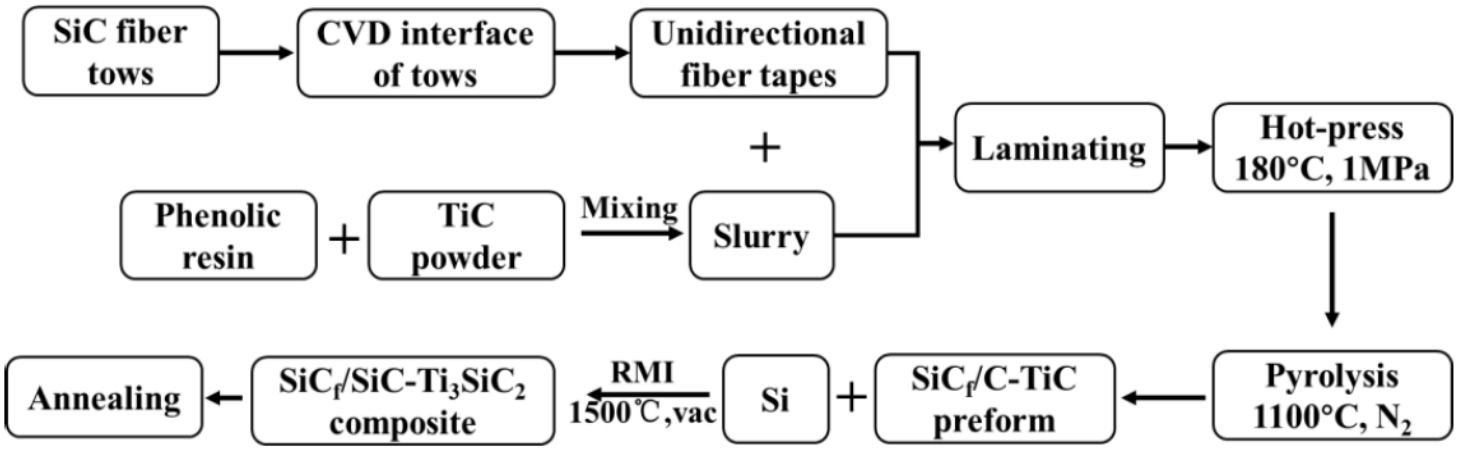

Figure 1

Process flow diagram of composites preparation

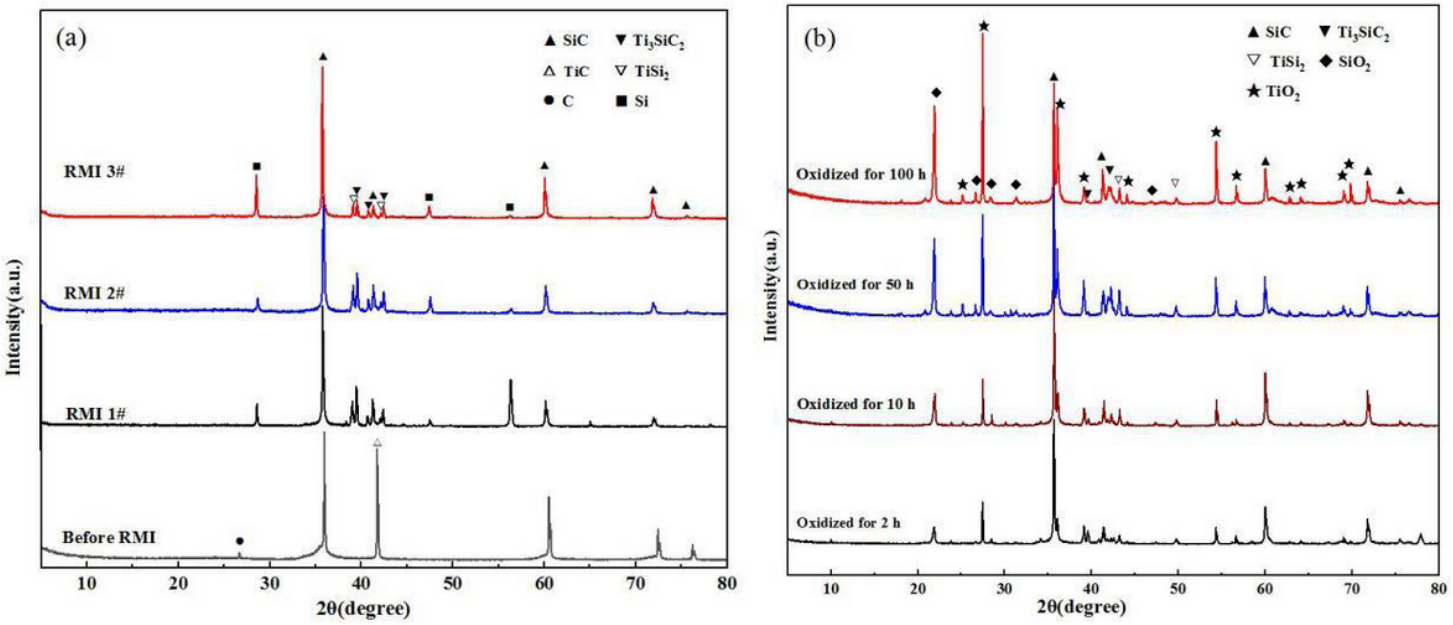

Figure 2

XRD patterns of the SiCf/SiC-Ti3SiC2 composites (a) before and (b) after oxidation at 1300 °C for different duration.

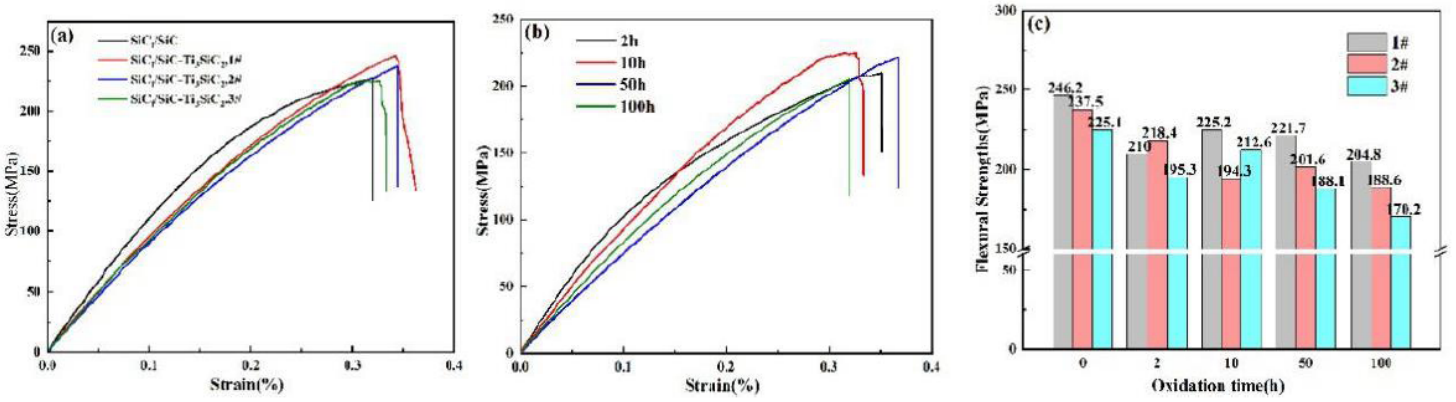

Figure 3

Stress-strain curve of the composition (a)before oxidation and(b)after oxidation (1#) for different time at 1300 °C, (c) variation of flexural strength and oxidation time at 1300 °C

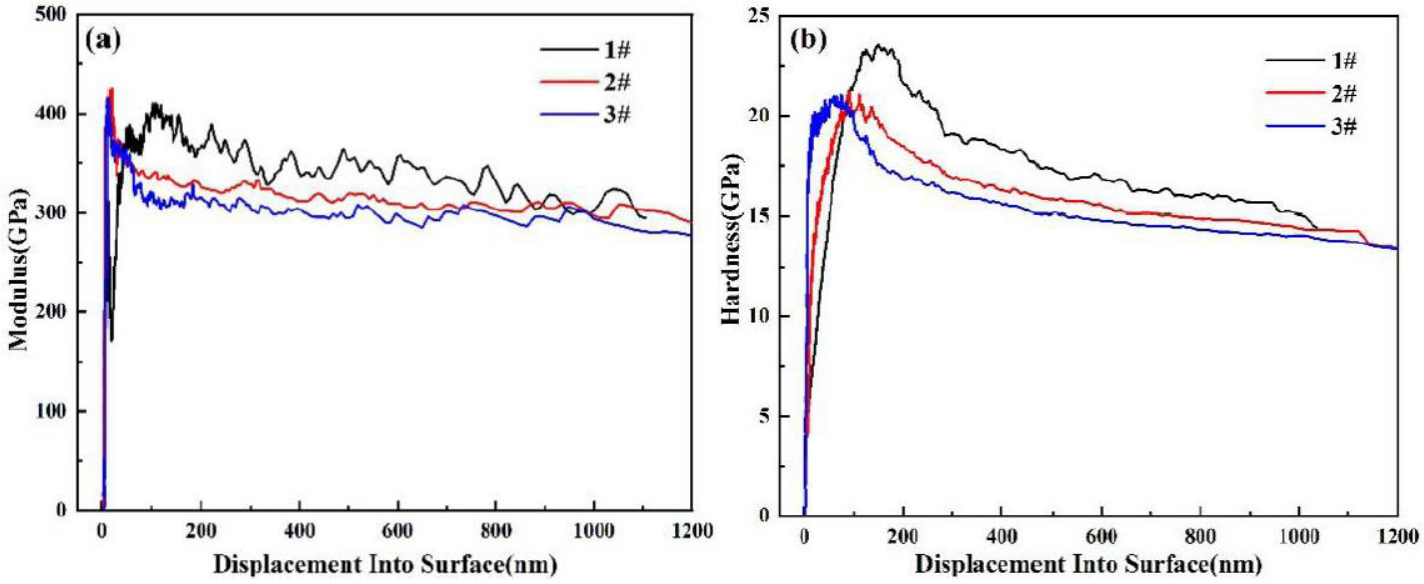

Figure 4

The curve of modulus and hardness with indentation depth variation

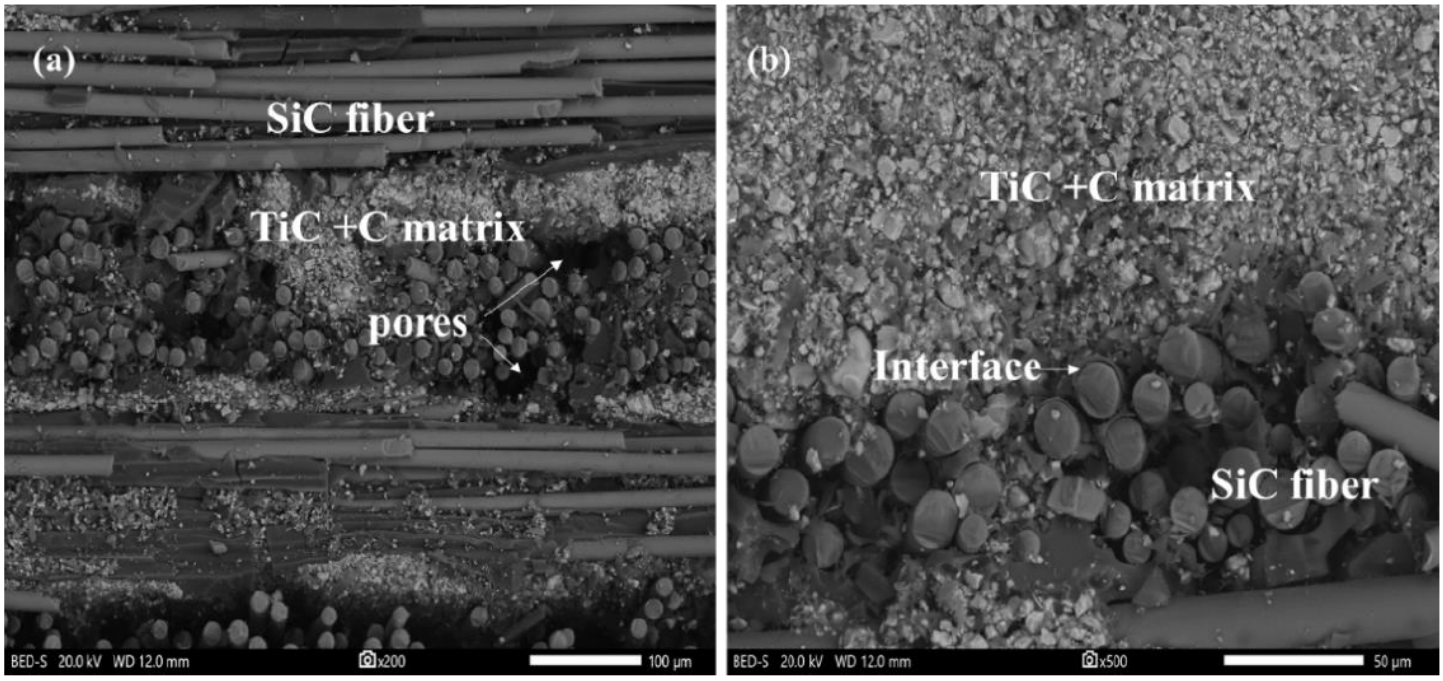

Figure 5

SEM images of the cross-section of the SiCf/C-TiC preform, (a)(b):1#.

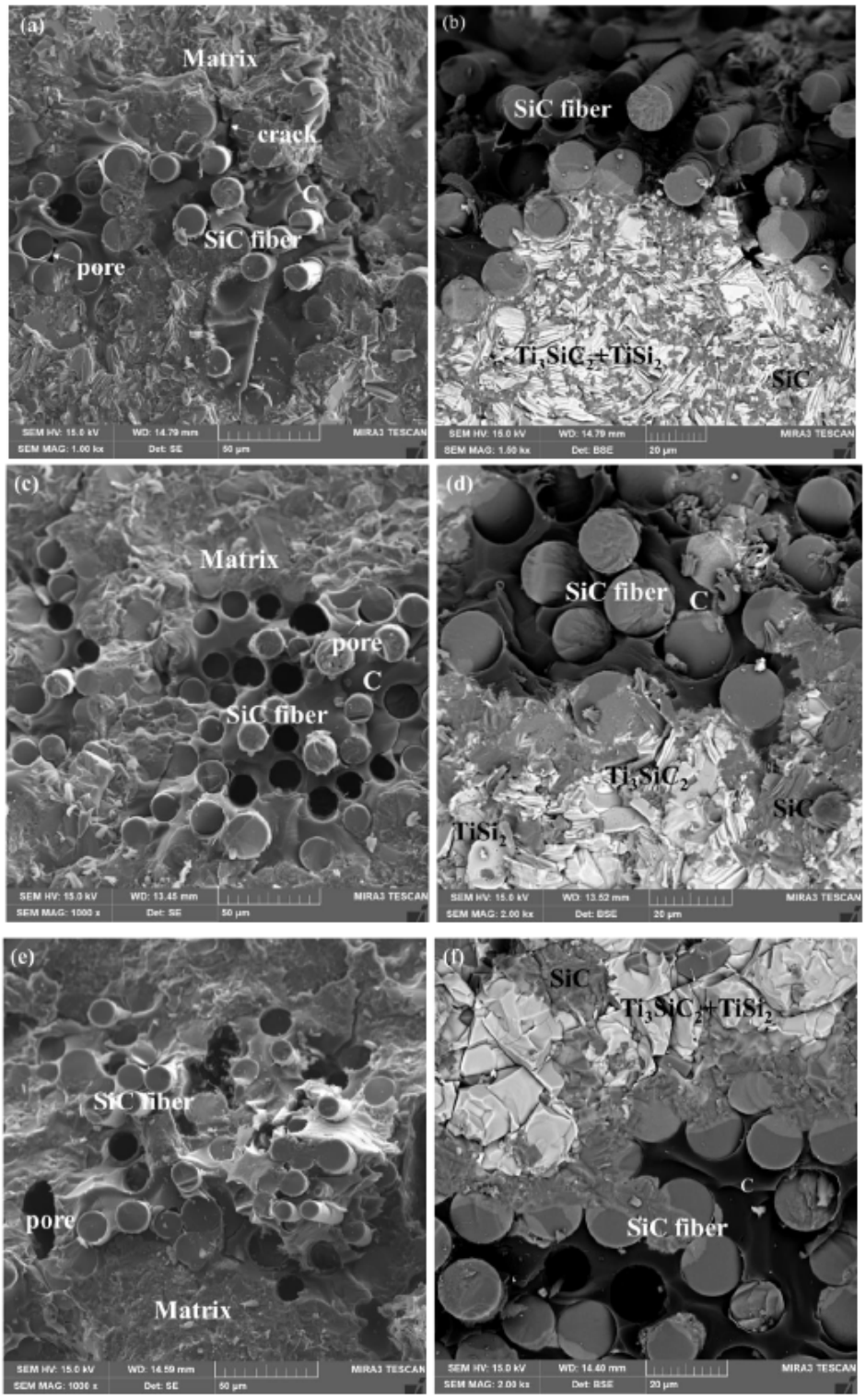

Figure 6

SEM images of the cross section of the SiCf/SiC-Ti3SiC2 composites (a)(b):1#;(c) (d):2#;(e) (f):3#

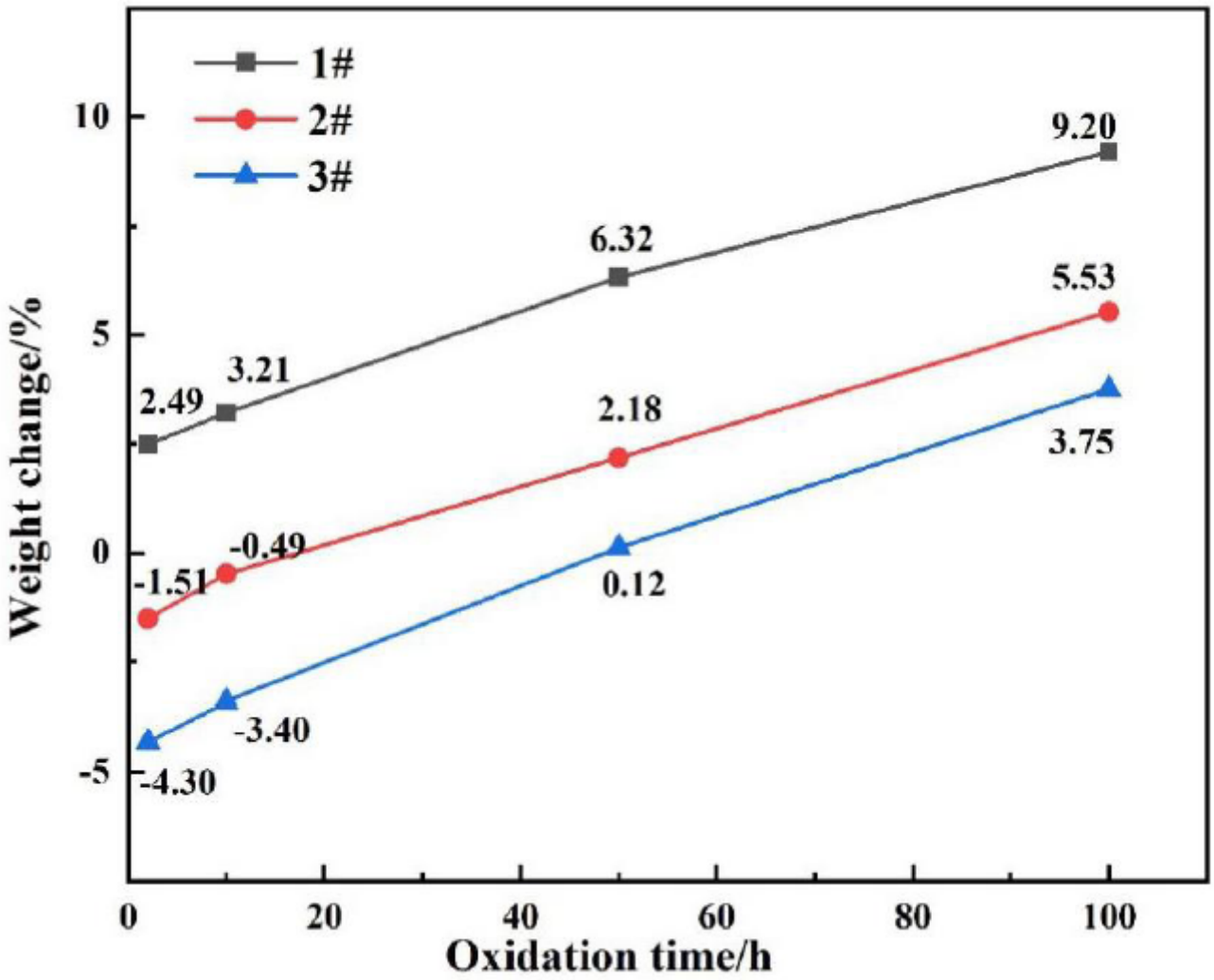

Figure 7

The weight change curve with oxidation time.

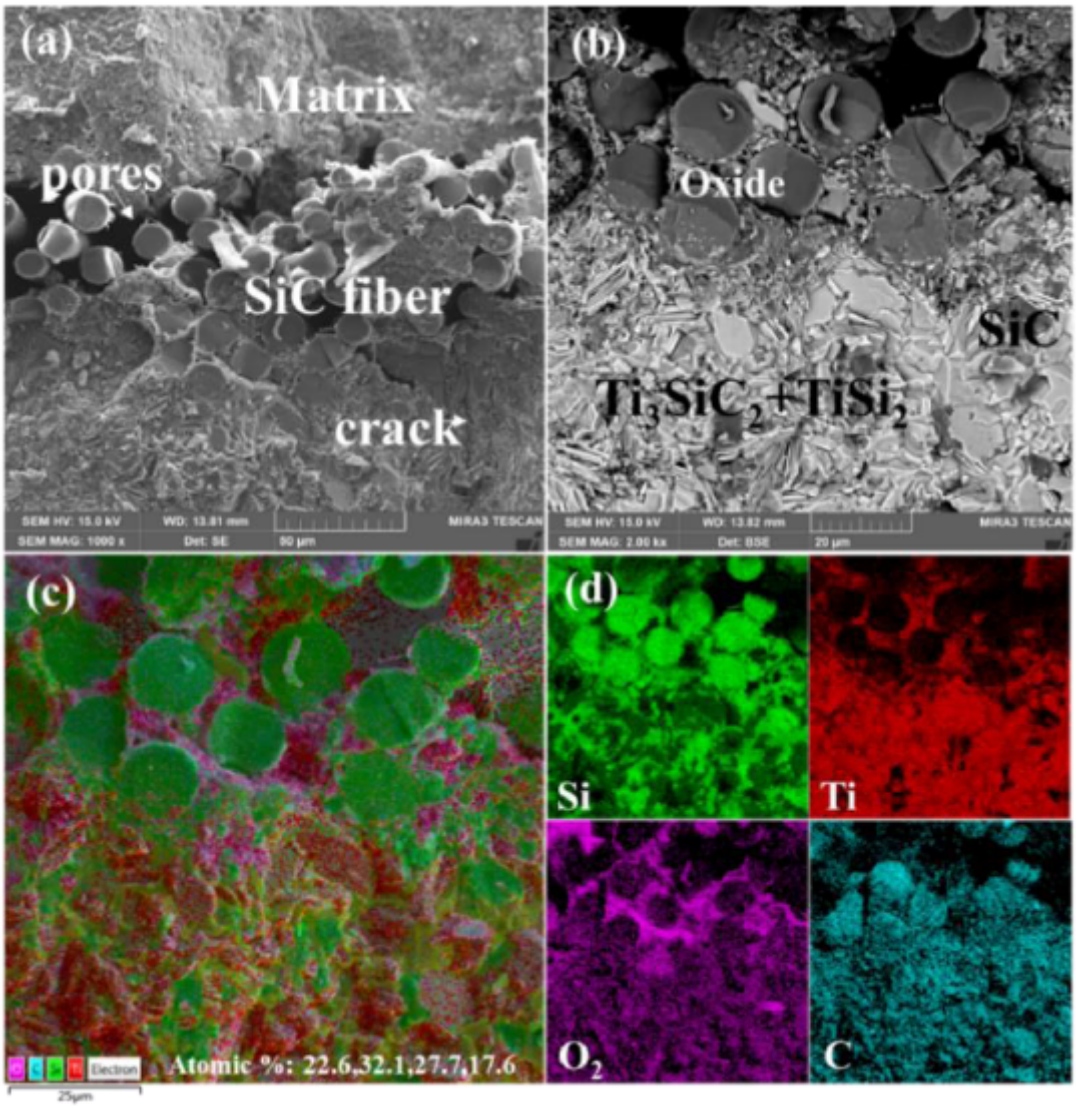

Figure 8

SEM(a), BSE(b), MAP(c) and elemental map(d) images of the cross-section of the SiCf/SiC-Ti3SiC2 composite oxidation for 2 h ,1#

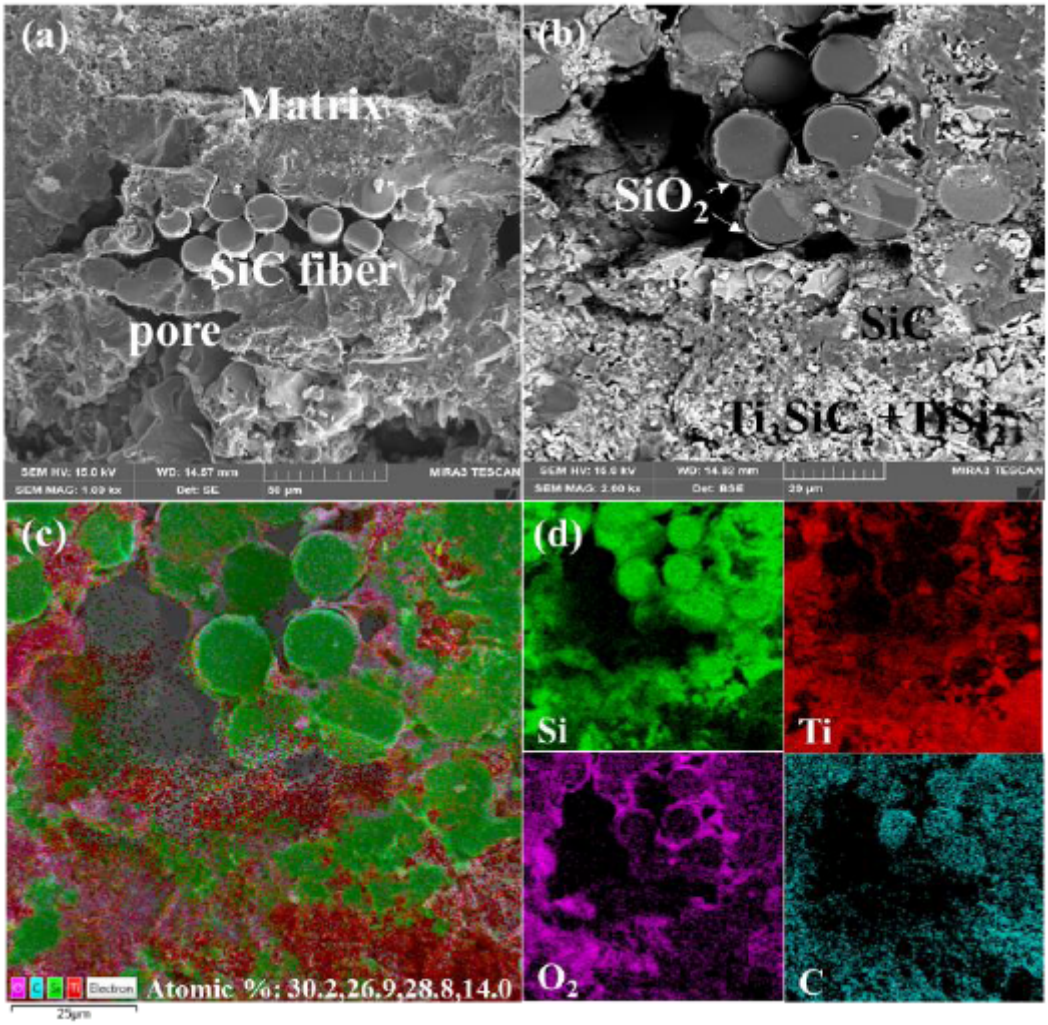

Figure 9

SEM(a), BSE(b), MAP(c) and elemental map(d) images of the cross-section of the SiCf/SiC-Ti3SiC2 composite oxidation for10 h ,1#

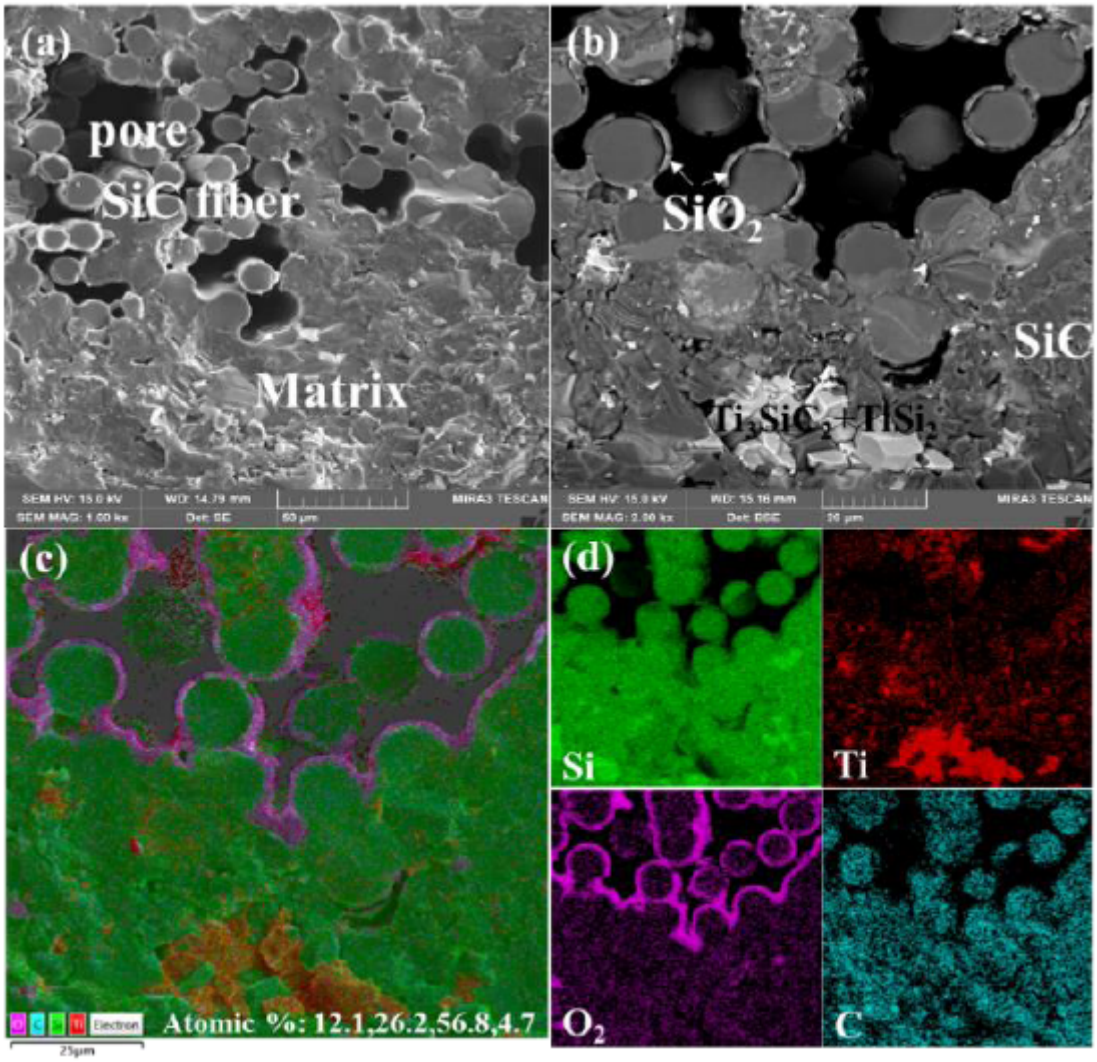

Figure 10

SEM(a), BSE(b), MAP(c) and elemental map(d) images of the cross-section of the SiCf/SiC-Ti3SiC2 composite oxidation for 50 h ,1#.

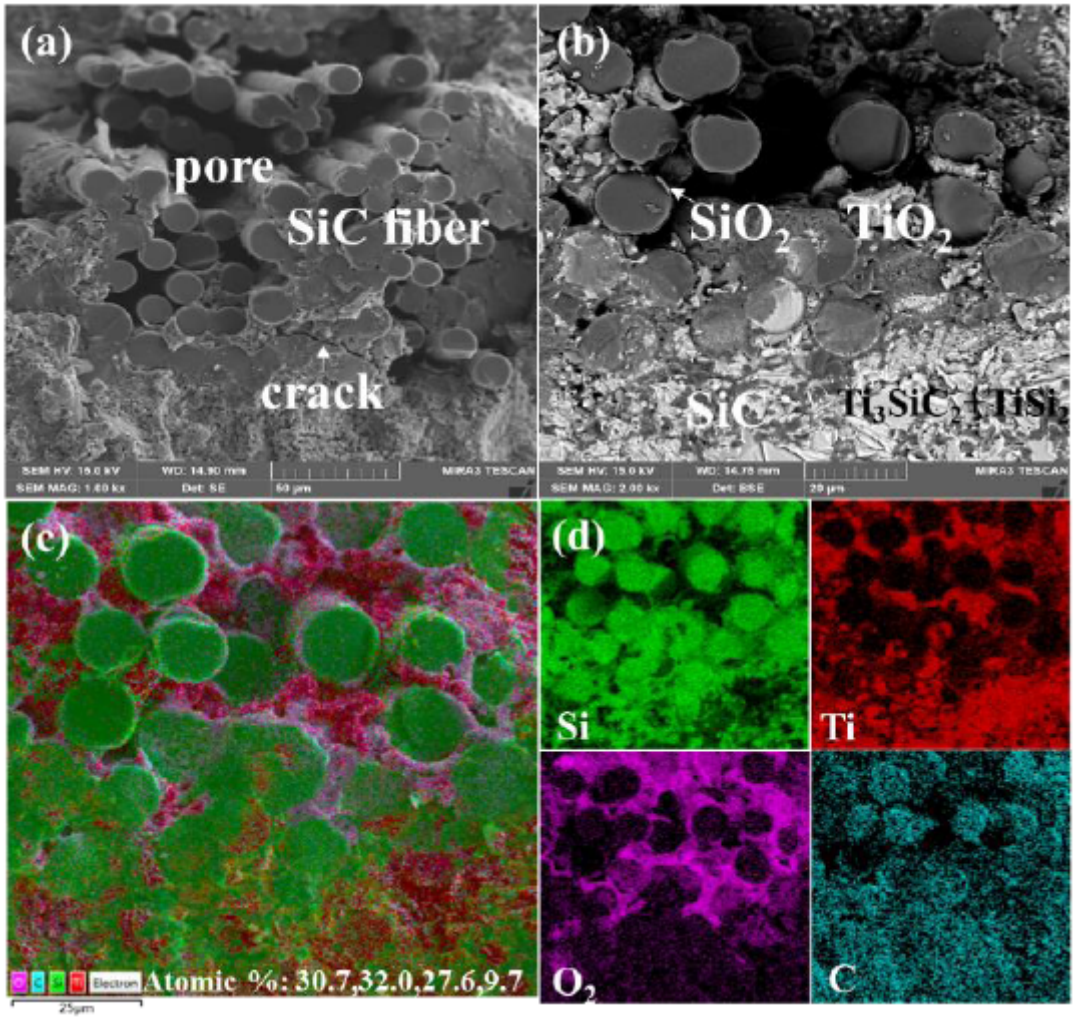

Figure 11

SEM(a), BSE(b), MAP(c) and elemental map(d) images of the cross-section of the SiCf/SiC-Ti3SiC2 composite oxidation for 100 h ,1#.