Supplementary Material

Excellent microwave absorbing properties of B_4C nanowires and B_4C/SiC hybrid nanowires

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This supplementary material contains:

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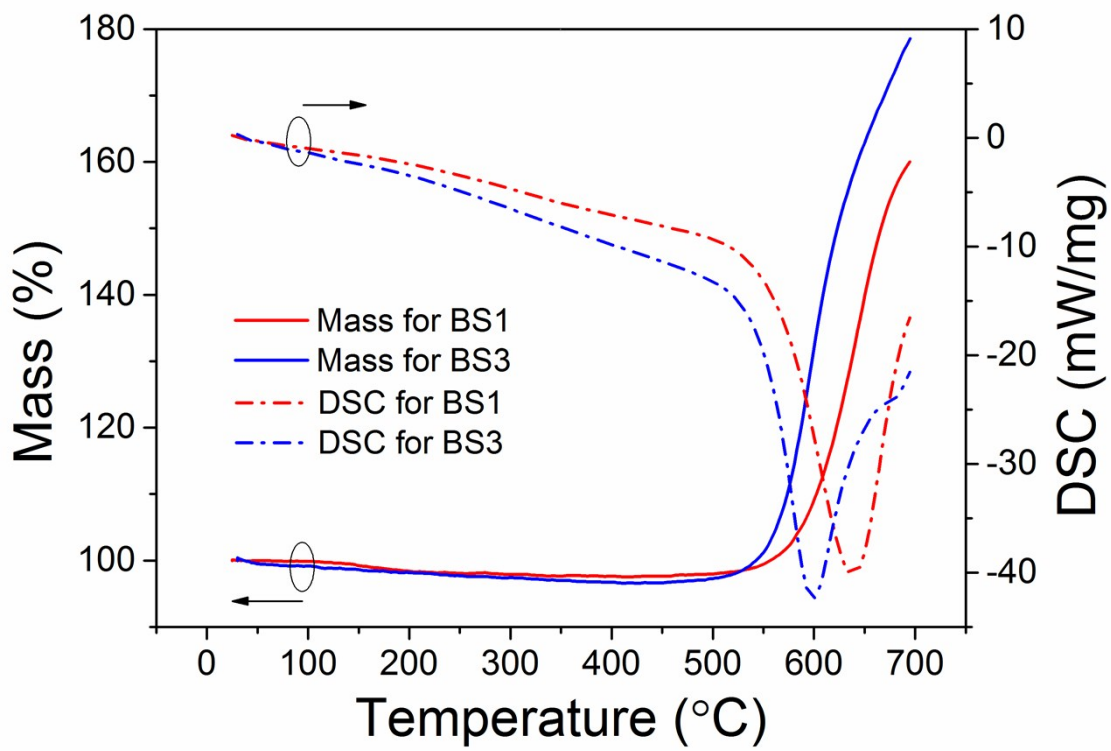

Fig. S1 TG/DSC curves of as-synthesized samples BS1 and BS3

We carried out the TG/DTA experiments for BS1 and BS3 from room temperature to 700 °C in air atmosphere. As shown in the Fig. S1, mass of both samples exhibited a slight decrease in the temperature range of 25-450 °C, which can be attributed to the release of absorbing gas and water in the raw powders. Endothermic peaks occurred in DSC curves when temperature increased to 500 °C, accompanying by a mass increase in both samples. To our knowledge, the reaction and mass change of the samples may involve two chemical processes: the burning of residual carbon in the samples, and the oxidation of B_4C into B_2O_3. The former could cause a mass decrease while the latter would lead to the opposite: a mass increase, because B_2O_3 is in solid phase below 800 °C. Therefore, it is quite hard to determine the content of residual carbon. It's a pity that higher temperature of TG/DTA

experiment is not allowed for our samples, because the evaporation of B_2O_3 at higher temperature is detrimental to the sensors of the equipment. Anyway, we could still find a clue that the mass increase in BS1 took place at higher temperature than BS3, because mass decrease during the burring of residue carbon compensated with the mass increase during the oxidation of B_4C into B_2O_3. This result is in line with what we found in XRD and Raman characterizations.

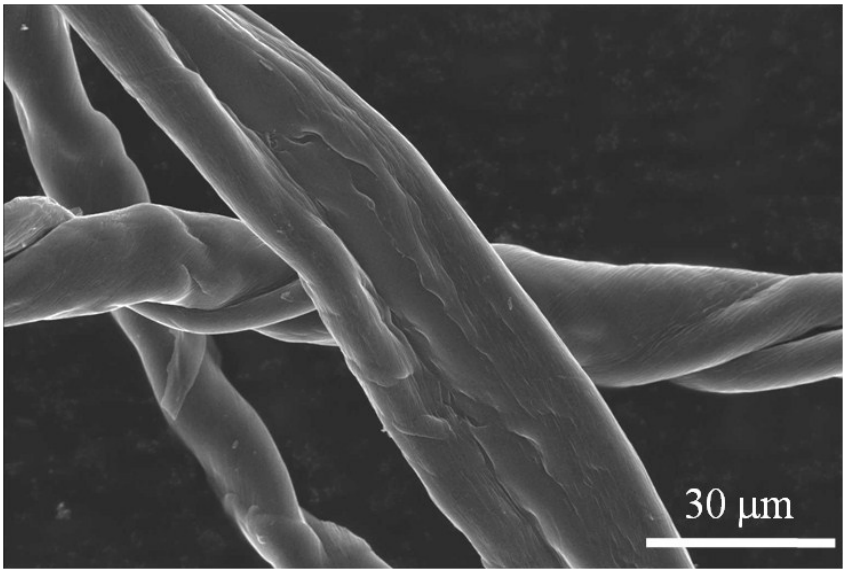

Fig. S2 SEM picture of pyrolyzed carbon fibers from degreasing cotton

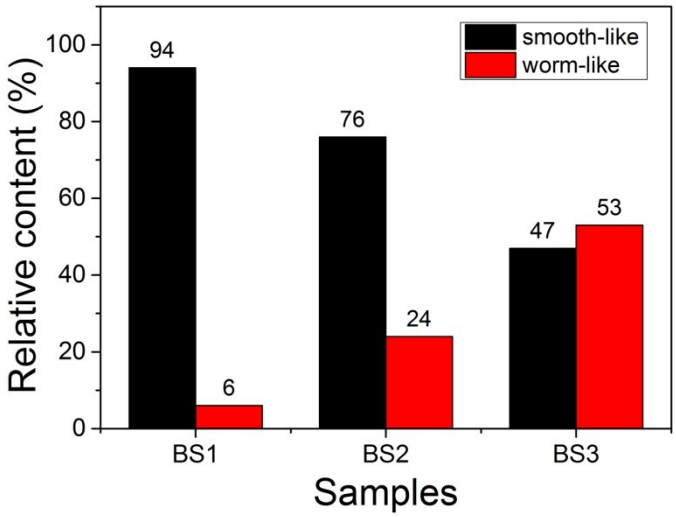

Fig. S3 Statistics about the relative amount of morphology 1 and 2 for BS1, BS2 and

BS3.

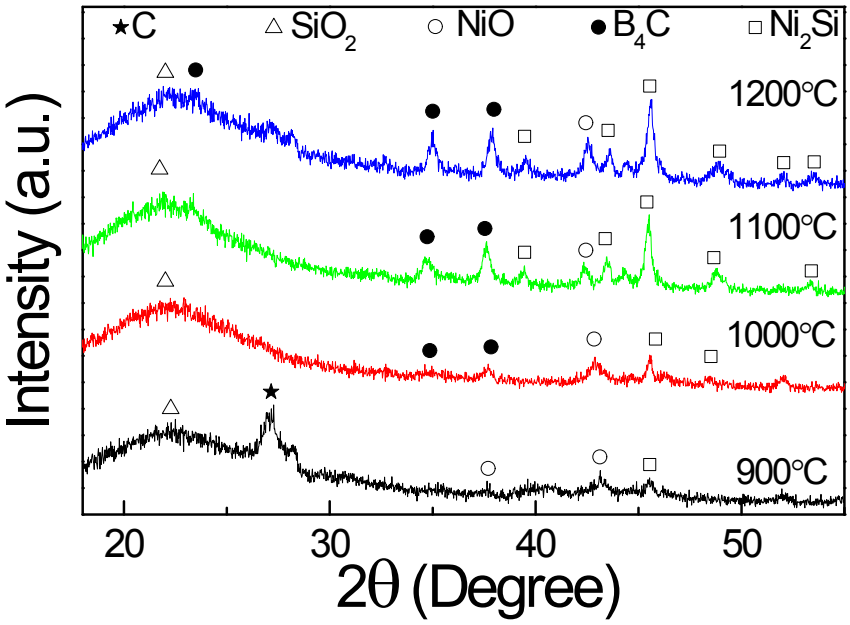

Fig. S4 XRD patterns of as-synthesized products from BS3 calcined at different temperature

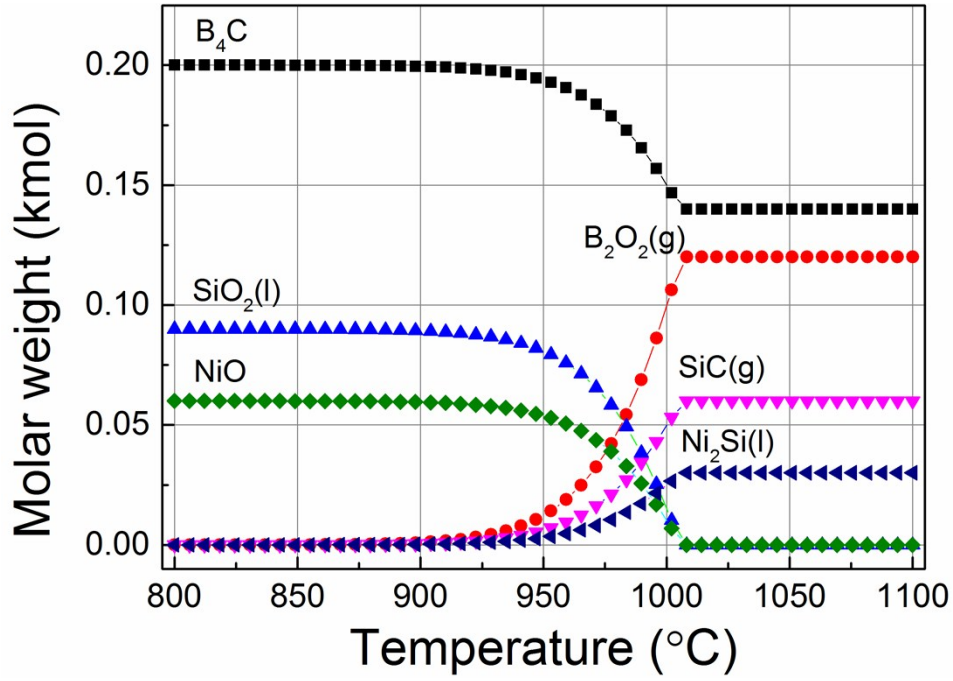

Fig. S5 Thermodynamic calculations of the equilibrium composition of the reactions.

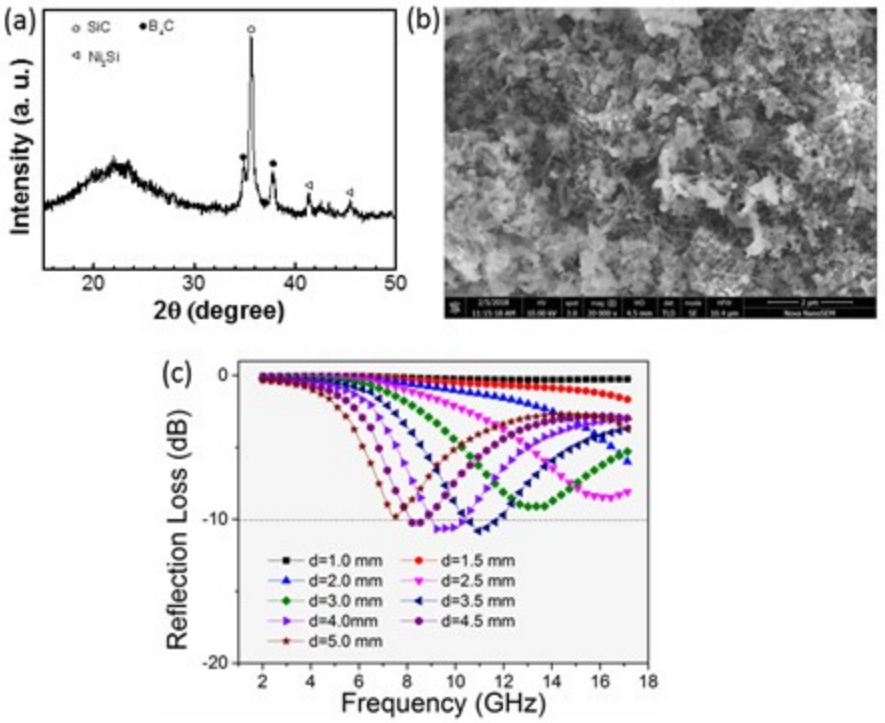

Fig. S6 (a)XRD pattern, (b) SEM picture and (c) frequency dependence of the microwave reflection loss for the as-synthesized product of C/SiO_2=1:0.72

As can be seen in Fig. S5(a), the main phase in the sample has changed to SiC phase. Meanwhile, the amount of the nanowires has decreased largely (see Fig. S5(b)), and the EM absorption performance is poor (see Fig. S5(c)). From these results, we concluded that the good performance of the sample in the present work is not only related to the size of the SiC particles, but also closely determined by the composition and morphology of B_4C and SiC phase. Microstructure control and design are key factors during the synthesis of the samples.

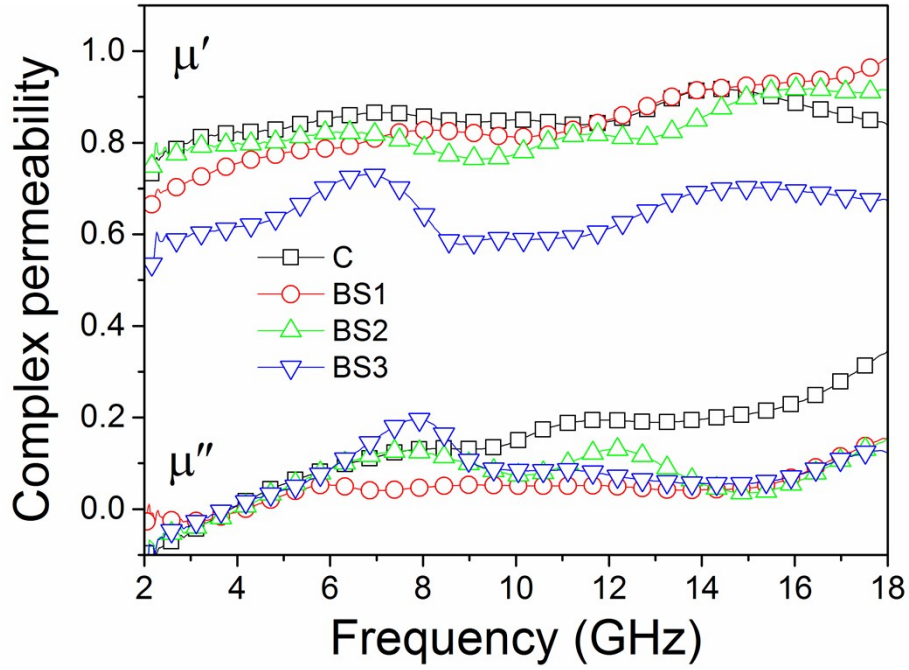

Fig. S7 Complex permeability of the B_4C/SiC-paraffin composites