

## Supporting Information

### **Enhancing Electrical Conductivity in Zirconium-Doped SiC Ceramics through Synergistic Effects of Crystal Structure and Free Carbon Control**

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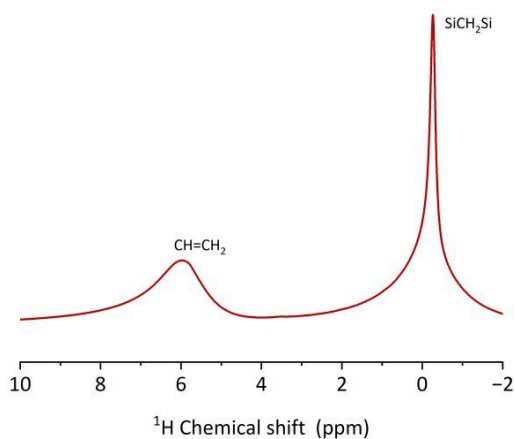
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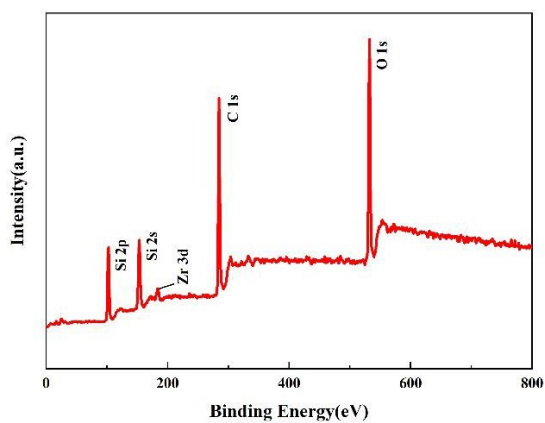
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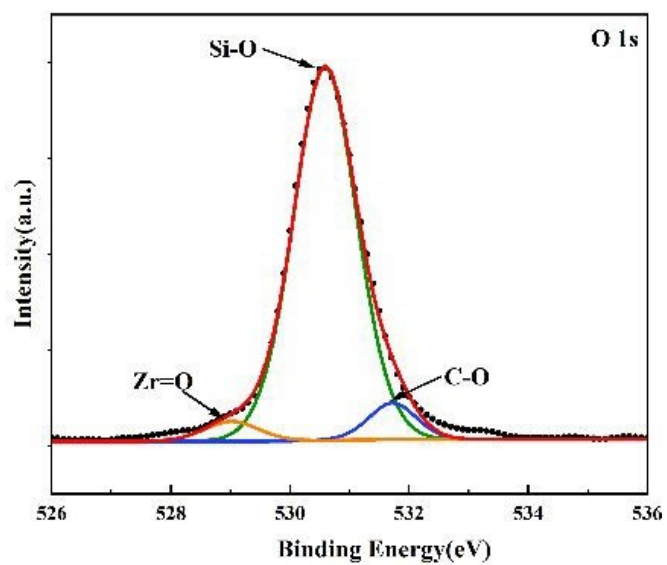
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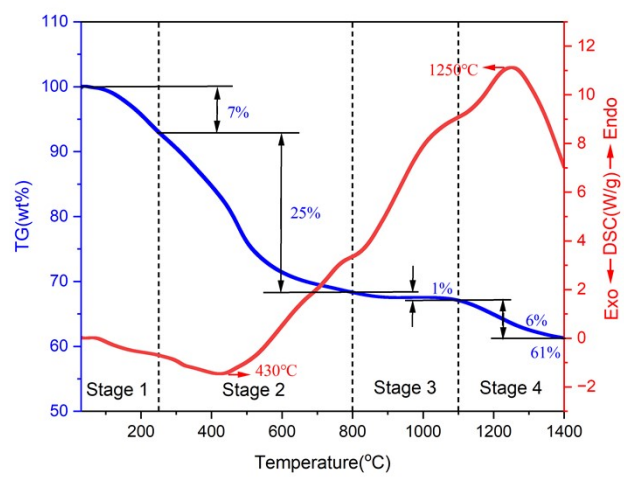
**Fig. S1** Nuclear magnetic resonance spectroscopy spectrum of  $^1\text{H}$ -NMR for the molecular.



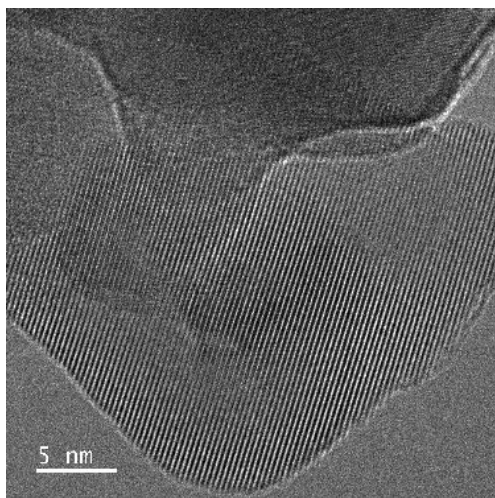
**Fig. S2** The XPS full elements exhibits in the PVZCS, with atomic proportions of 55.6 wt%, 23.82 wt%, 20.04 wt%, and 0.54 wt%, respectively.



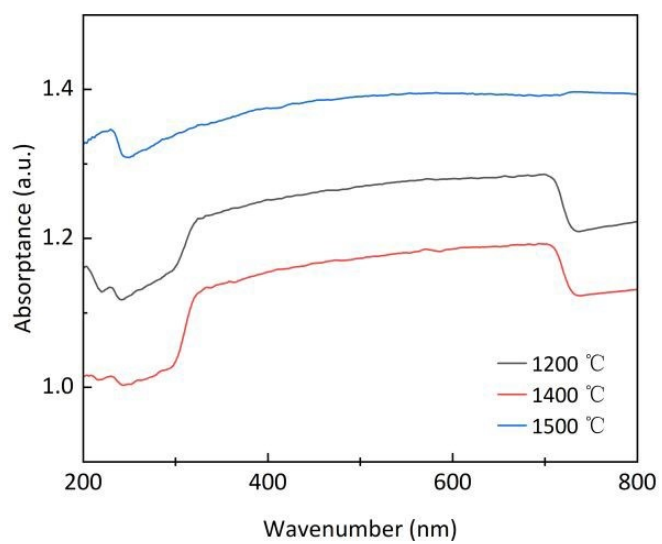
**Fig. S3** O 1s XPS spectrum spectra of indicated PVZCS.



**Fig. S4** TGA-DSC profile of PVZCS.



**Fig. S5** TEM image of PVZCS pyrolysis at 1600°C



**Fig. S6** The UV spectrum of the samples.