Active Oxidation of SiC

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Microscopy of Oxidation 8, Liverpool, UK  April 10-13, 2011

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Abstract

The high temperature oxidation of silicon carbide occurs in either a passive or active mode, depending on temperature and oxygen potential. Passive oxidation forms a stable oxide scale and leads to enhanced attack of the SiC. 

SiC + 3/2 O2(g) + 2 CO(g)  

The transition points and rates of passive oxidation are variable. 

Previous studies have reviewed the leading theories of passive/passive transitions. Comparison is made to the active/passive transition in SiC, which are relatively well understood. Critical parameters include the difference between the passive mode and passive mode to active mode transition. 

Garrett and Wagoner [2] points out that for the active-to-passive transition, the active mode is considered. The passive mode is considered for the active-to-passive transition. The focus of this study is on the active-to-passive transition. The active-to-passive transition is considered for the active mode. The transition point is considered for the active mode. The transition point is considered for the active mode. 

Summary and Conclusions

• Active oxidation of SiC: 
  - SiC(s) + 1/2 O2(g) = SiO(g) + CO(g)  
  - Unexplored area is the difference between the passive-to-active and passive-to-active transition.

• Pre-Oxidation and the Breakdown of the Passive Scale: 
  - Experiment: Form 0.1, 1, 2 micron SiC scales on CVD SiC [17] 
  - Expose to known active oxidation environment (100 ppm O2, Ar/1450°C) 
  - Determine how the passive scale breakdown 
  - Gives insights into the passive-to-active transition

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Wagner: Active-to-Passive Transitions for Silicon [2]

Oxygen strikes a bare Si surface, gradually increases PO(g). 

SiC(s) + O2(g) = SiO(g) + CO(g) 

• Generates sufficient SiO(g) from reaction (a) for stable SiO2 equilibration reaction (b) 

SiC(s) + O2(g) = SiO2(s) + CO(g) 

References