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ZTA Graphite-Gas Reactions At Elevated Temperatures*

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ABSTRACT

The reactions of ZTA graphite with various gases have been studied at temperatures between approximately 1400° and 3000°K and reactive gas pressures between 50 and 500 torr. Pressures below 500 torr were obtained by using argon as a carrier gas. Reaction rates for the heterogeneous gas-solid reactions were obtained by impinging high velocity reactive gases normal to the graphite surface and determining the surface recession at the stagnation point as a function of time. Specifically, this work has shown that reaction rates kinetically limited by surface reactions can be achieved and measured at temperatures approaching 3000°K under conditions of stagnation point flow. Several of the systems showed the anomalous effect of a decrease in reaction rate with increasing temperature over a limited temperature range. This, of course, makes futile any estimate of high temperature behavior through extrapolation of low temperature data. A mechanism is proposed for theoretically calculating reaction rates for heterogeneous gas-solid reactions in general.

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