

The Effect of Gaseous Environment on the Flexural Strength
of Graphite

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D. H. Logsdail

SUMMARY

Many reports in the literature have shown that the strength of graphite increases with temperature, but few have discussed the influence of the environment in which the measurements are made. To investigate therefore, the effect of gaseous environment alone, the flexural strength and breaking strain of graphite have been determined in high vacuum and in different gases at pressures between 10^{-6} torr and 1 atmosphere. Measurements have also been made at various loading rates and at temperatures up to $1,500^{\circ}\text{C}$.

The results have shown that after degassing at elevated temperatures and allowing to cool at pressures below 10^{-5} torr the strength of a British reactor grade graphite increased by up to 40%. For periods of degassing up to 24 hours at $1,250^{\circ}\text{C}$ the strength of specimens cut perpendicular to the extrusion axis increased steadily with time of degassing whereas the major portion of the strength increase of parallel cut specimens occurred within about 4 hours. The breaking strains were also determined and these values showed a corresponding increase with time of degassing.

When the graphite was exposed to small amounts of air after degassing the strength fell to the normal value, but the loss in strength after exposure to dry nitrogen, oxygen or carbon dioxide was much smaller, suggesting an important effect of water vapour.

February, 1967.