MATERION

TECH BRIEFS

# Stability of Copper Beryllium at Elevated Temperatures

Alloy 25 copper beryllium retains much of its room temperature strength at temperatures up to 260°C (500°F).

## ELEVATED TEMEPRATURE PROPERTIES

Brush Alloy 25 (CuBe2, C17200) is a precipitation age hardening copper alloy containing nominally 1.85 weight percent beryllium and 0.25 weight percent cobalt. This alloy is well-known for its high strength capability, very good thermal and electrical conductivities, and resistance to stress relaxation.

Although much is known about the performance of strip (<2 mm thick) at elevated temperature, most of the knowledge relates to stress relaxation resistance. This is an important requirement in highly loaded, but fixed displacement, applications. Little, if any, published creep data exists, however. This Techbrief summarizes data relating to performance at elevated temperatures of heavier section geometries (25-100 mm in cross section). Figure 1 is simple tensile test data obtained by heating HT rod specimens to a target temperature and testing. Figure 1a is a plot of 0.2% offset yield strength and ultimate tensile strength. The yield strength at room temperature (RT) for this lot was 1100 MPa (160 ksi) and the ultimate tensile strength was approximately 1275 MPa (185 ksi), typical for a rod, bar, or tubular product. 90% of the RT yield strength was retained up to a temperature of 230-260°C (450-500°F), excellent for a copper alloy. Correspondingly, Figure 1b, a plot of ductility, shows the reduction-in-area and total elongation values as measured in the same standard tensile tests. Similar behavior is expected for AT tempers of Brush Alloy 25.

Of interest frequently is data relating to longer term endurance of metals and alloys at elevated temperature. Brush has conducted testing relating to the retention of strength at room temperature after exposure to elevated temperature. Performance in this test is an indication of the stability of the fine-scale microstructure which can be linked to performance under service loads at elevated temperature. As demonstrated in Figure 2, the yield strength and elongation of AT and HT temper products is very stable after exposures exceeding 100 hours at (260°C) 500°F. This data supports the use of Brush Alloy 25 in aerospace applications as indicated by MMPDS-05 (Apr. 2010) which rates the use of this copper beryllium alloy to 260°C (500°F).

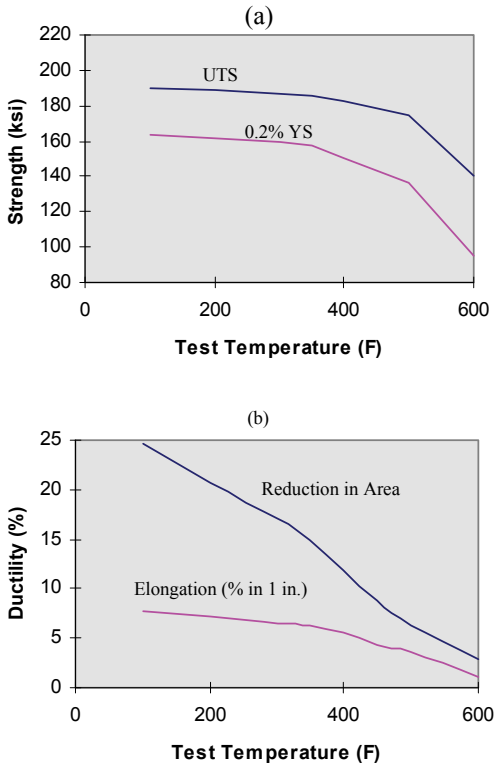


Figure 1. Elevated temperature tensile properties for Brush Alloy 25. (a) 0.2% offset yield and ultimate strengths. (b) ductility as indicated by reduction-in-area and total elongation.

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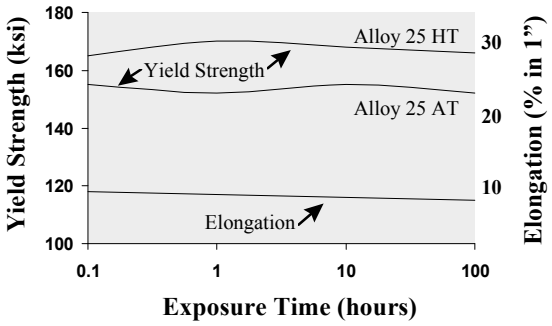


Figure 2. Resistance to elevated temperature exposures in excess of 100 hours at 260°C (500°F). Samples were exposed for the indicated times and tested at room temperature.

## SAFE HANDLING OF COPPER BERYLLIUM

Handling copper beryllium in solid form poses no special health risk. Like many industrial materials, beryllium-containing materials may pose a health risk if recommended safe handling practices are not followed. Inhalation of airborne beryllium may cause a serious lung disorder in susceptible individuals. The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational respiratory exposures. Read and follow the guidance in the Material Safety Data Sheet (MSDS) before working with this material. For additional information on safe handling practices or technical data on copper beryllium, contact Materion Brush Performance Alloys, Technical Service Department at 1-800-375-4205.

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