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Development of High Temperature Mo-Si-B Based In-situ Composites

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Abstract : The search for new materials has begun to be used even higher than the service temperature (~1150°C) where nickel-based superalloys are currently used. This search should also meet the increasing demands for energy efficiency improvements. The materials studied for aerospace applications are expected to have good oxidation resistance. Mo-Si-B alloys, which have higher operating temperatures than nickel-based superalloys, are candidates for ultra-high temperature materials used in gas turbine and jet engines. Because the Moss and Mo_5SiB_2 (T2) phases exhibit high melting temperature, excellent high-temperature creep strength and oxidation resistance properties, however, low fracture toughness value at room temperature is a disadvantage for these materials, but this feature can be improved with optimum Moss phase and microstructure control. High-density value is also a problem for structural parts. For example, in turbine rotors, the higher the weight, the higher the centrifugal force, which reduces the creep life of the material. The density value of the nickel-based superalloys and the T2 phase, which is the Mo-Si-B alloy phase, is in the range of 8.6 - 9.2 g/cm³. But under these conditions, T2 phase Moss (density value 10.2 g/cm³), this value is above the density value of nickel-based superalloys. So, with some ceramic-based contributions, this value is enhanced by optimum values.

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