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β 锻造Ti-22Al-25Nb合金的组织转变与拉伸性能

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摘 要:采用SEM等方法观察经 β 相区温度锻造的Ti-22Al-25Nb合金在 β 相转变点以下不同热处理过程中的微观组织转变, 测试所得组织状态下的合金拉伸性能。对该合金的微观组织转变规律以及与拉伸性能的关系和机理进行分析。结果表明, 在固溶处理过程中, 组织中原有的 α_2 相颗粒和O相板条因溶解而减少, B2相基体含量相应增大; 固溶处理温度升高可加剧各相含量的变化趋势, 并在这一过程中伴随着B2相的再结晶且 α_2 相和O相的存在对B2相的再结晶有限制作用; 在时效过程中, O相以细小二次板条形式从B2相基体中析出, 或在残留的 α_2 相颗粒周边以块状形式生成。该合金经不同固溶+时效处理后均具有良好的室温及高温拉伸性能; 且因固溶温度升高造成细小O相二次板条含量增多而使合金呈强度升高、塑性下降的趋势, 其中以1 000 °C固溶+800 °C时效处理的状态具有强度和塑性的最佳匹配。

关键字: Ti-22Al-25Nb合金; 组织转变; 固溶温度; 拉伸性能

Microstructure transition and tensile properties of Ti-22Al-25Nb intermetallic alloy forged in β -phase zone

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Abstract: Microstructure transition of Ti-22Al-25Nb intermetallic alloy forged in β -phase zone during different heat treatments were observed by SEM, and the tensile properties were also tested. The law of microstructure transition and the relationship between the microstructure and the properties were analyzed. The results show that during the solution process, the content of B2 matrix increases while those of the α_2 phase and the O phase decrease for dissolution; this trend is aggravated with the increase of the solution temperature, going along with the recrystallization of B2 phase. The recrystallization of B2 phase is limited by the existence of α_2 phase and O phase. At the age process, the slender O laths precipitate from the B2 matrix or around the retained α_2 particles in massive form. The alloy has good tensile properties at room or elevated temperature after different heat treatments. With the increase of the solution temperature, the slender

secondary O laths increase, which makes the strength increased and the ductility decreased. After 1 000 °C solution +800 °C aging treatment, the alloy has the best combinations of the strength and ductility.

Key words: Ti-22Al-25Nb intermetallic alloy; microstructure transition; solution temperature; mechanical property

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