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合金钢的退火不软化行为

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摘要: 某些合金经热处理后产生退火不软化问题. 作者对 $W_{18}Cr_4V$ 和 $18Cr_2Ni_4WA$ 2种合金钢进行了锻后软化退火试验, 对退火组织进行了SEM分析, 对合金钢的退火不软化原因进行了探讨, 提出钢的退火必须根据等温转变C曲线(即TTT图), 以确定其方法与工艺, 从而获得最佳的切削加工性能. 实验结果表明: $W_{18}Cr_4V$ 钢经普通退火处理, 硬度偏高(269~286 HBS); 采用等温退火方法, 软化效果好, 满足了切削加工对硬度的一般要求(<255 HBS); 无论采用何种退火方法, $18Cr_2Ni_4WA$ 合金钢的硬度均不能满足要求, 只有采用高温回火的办法, 方可使其软化.

关键字: 合金钢; 退火软化; 等温退火

The anti-annealing softening behaviour of alloy steel

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Abstract: The soften annealing experiment of two kinds of alloy steels $W_{18}Cr_4V$ and $18Cr_2Ni_4WA$ has been carried out. In combination with the analysis of SEM micrographs, the mechanism of anti-annealing softening behaviour of these steels was discussed. It is pointed out that, in order to get a good machinability, it is necessary determine the heat treatment procedure carefully according to the isothermal phase transformation curves (i.e. TTT figure) of these steels. The results showed that the hardness of $W_{18}Cr_4V$ after common annealing was a bit too high, and the soften effect was much better by isothermal annealing, the annealed hardness (<255 HBS) was satisfying for cut machining, while for $18Cr_2Ni_4WA$, no matter how it is annealed, it was difficult to soften. The hot forged $18Cr_2Ni_4WA$ can be fully softened only by high temperature tempering. An observation on annealed microstructure by SEM was conducted. It was found there was some difference on the particle size of carbide in the HSS ($W_{18}Cr_4V$) microstructure after austenizing at $800^{\circ}C$ and then, is other mal annealing at $720^{\circ}C$ and $750^{\circ}C$ respectively. When the decomposition of overcooled austenite takes place at higher temperature, the lower the temperature of isothermal annealing, the more fine dispersed carbide particles were yielded. This microstructure difference evidently affects the annealed hardness.

Key words: alloy steel; annealing soften; isothermal annealing

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