

-1/4 Cr-1Mo-1/4

Development of Submerged Arc Welding Consumables for 2-1/4Cr-1Mo-1/4V Steel

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482 20.6MPa(210kgf/cm<sup>2</sup>)H<sub>2</sub>

-1/4Cr-1Mo-1/4V

(1)

Nb 0.033

Nb

Nb

(3)

Cr Mo Fe

Cr Mo Fe

>\*>T > ýÀ0\*À5h

100MPa

2-1/4

Synopsis :

In order to raise the desulphurizing efficiency, 2-1/4 Cr-1Mo-1/4 V steel is expected to be applied to a direct hydrogen desulphurizing reactor operated at a higher temperature and pressure. Narrow gap submerged arc welding consumables for the 2-1/4 Cr-1Mo-1/4 V steel were developed through the investigation of the effects of V and Nb contents in weld metal on tensile strength, toughness and creep rupture strength of weld metal. Tensile and creep rupture strengths of the weld metal increase with increasing V and Nb contents in the weld metal. An excessive Nb addition, however, decreases toughness of weld metal. The optimum V and Nb contents in the weld metal to satisfy both creep rupture strength and toughness are 0.20-0.30% and 0.015-0.025%, respectively. Fine precipitates which contained Cr, Mo, Fe, V and Nb were observed by transmission electron microscopy in the newly developed weld metal containing 0.29% V and 0.018% Nb besides the coarse ones containing Cr, Mo, Fe and V which were observed in the conventional weld metal containing 0.07% V. Due to these fine precipitates, the newly developed weld metal showed about 100 MPa higher creep rupture strength at 482

for 100 000h than the conventional one and excellent resistance to hydrogen attack.

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for 2 $\frac{1}{4}$ Cr-1Mo- $\frac{1}{4}$ V Steel

要旨

亜鉛塗布の必要性和機械的性質の向上に寄与する

においては、溶接金属の靱性を低下させることなく、クリープ破断

## 2.2 実験方法

ここでは、2 1/4 Cr-1 Mo-1/2 V 鋼狭間先サブマージアーク溶接 (SAW) 金属の短時間引張特性、クリープ破断特性等の強度特性および靱性に及ぼす V と Nb の影響およびその耐水素侵食特性について述べる。

### 2.2.1 供試材料と溶接方法

溶接金属の成分のうち、とくに V、Nb のクリープ破断強さおよび靱性に及ぼす影響を明らかにするために、Table 2 に示す板厚 60 mm の ASTM A 387 Gr.22 Cl.2 鋼板を用い、Table 3 に示す溶接条件で予熱およびパス間温度 150~225°C、溶接入熱量 2.4~3.0 kJ/mm の 1 局リバフ鉋田生り電極 SAW 法での溶接条件を如图 1 に

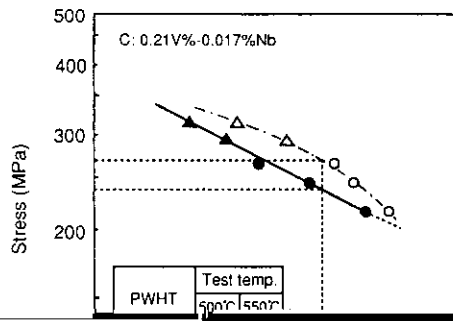
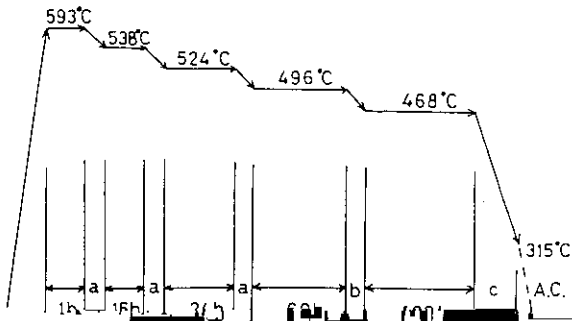
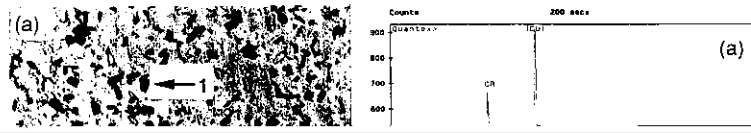


Table 5 Impact properties of 2 1/4Cr-1Mo-1/4V weld metals

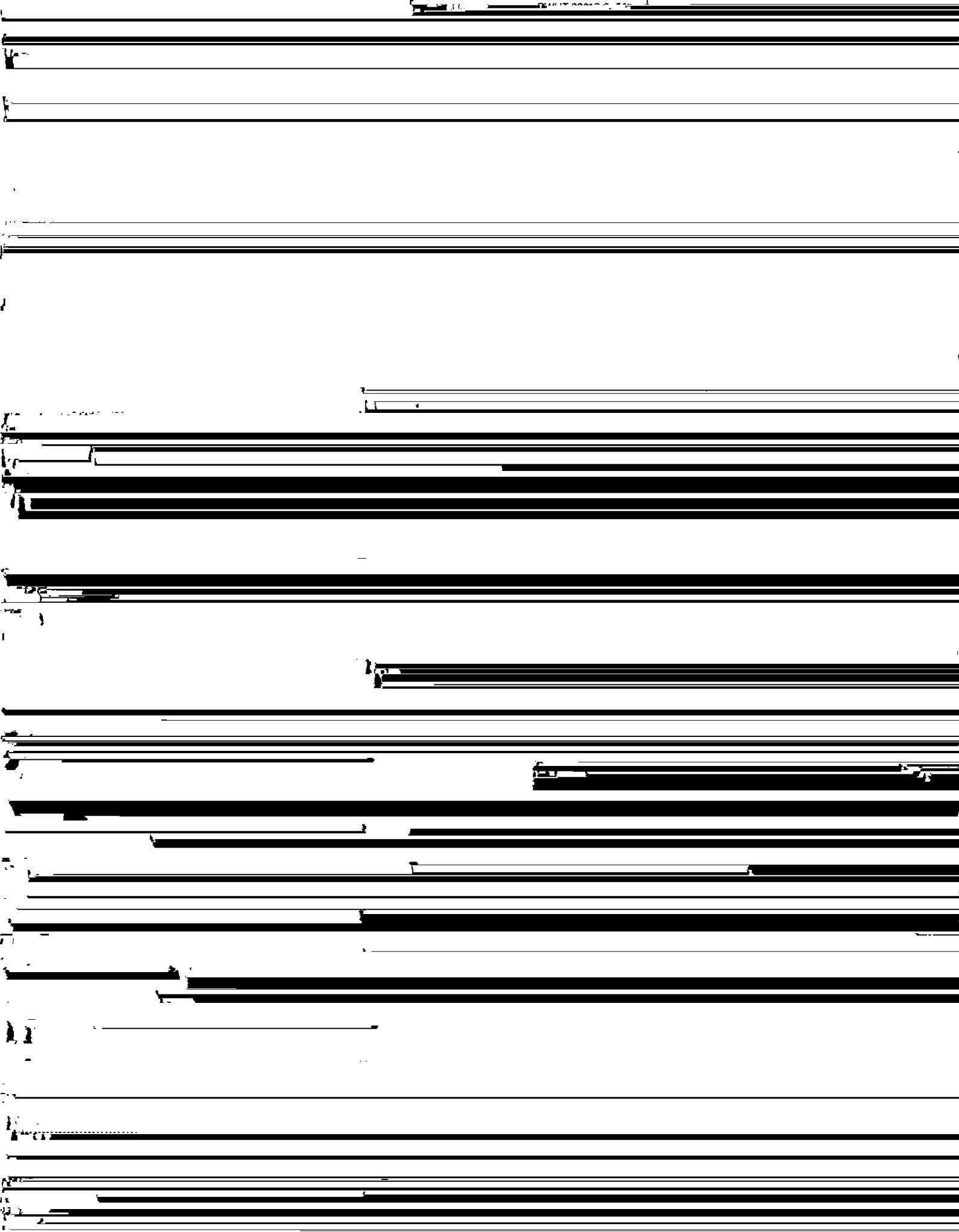
Tr<sub>50</sub> Tr<sub>50</sub> 50℃以下 50℃以下 50℃以下

Mark	$\sqrt{Tr_{50}}(^\circ C)^a$	$\sqrt{Tr'_{50}}(^\circ C)^b$	$\sqrt{Tr_{50}+3\Delta_v Tr_{50}}(^\circ C)^c$
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ると、VおよびNbの添加量が増加するとともに、室温引張強さ



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#### 4 結 言

重質油の水素添加直接脱硫リアクター用材料として、将来の操業

は690℃、8h PWHT条件では、室温引張強さが上昇し、靱性が大きく低下した。0.2~0.3%V-0.015~0.025%Nb系溶接金属において、良好な強度および靱性が得られた。

(4) 0.29%V-0.018%Nb系溶接金属の耐水素侵食特性は良好で