

Characteristics of Chromium Containing Alloyed Steel Powders with High Wear Resistance

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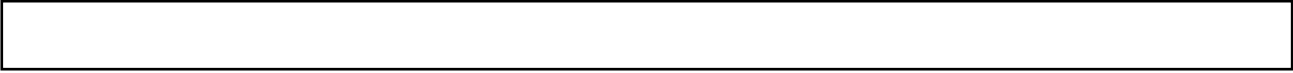
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:	Cr	
1% Cr-0.7 Mo-0.3% Mo	KIP 4100	-
	KIP 4100	
	1100 MPa	Cr
Mo		686 MPa
KIP 4100	0.10 Mg/m ³	7.18 Mg/m ³
KIP 4100	1420 MPa	KIP 4100
Ni		

Synopsis :

Alloyed steel powders containing Cr have been developed for the production of heavy-duty structural parts with high wear resistance. KIP 4100V is a low-oxygen pre-alloyed powder containing 1% Cr-0.7% Mn-0.3% Mo, and provides high compressibility. Produced by a water-atomizing and vacuum-annealing process, KIP 4100V attains a tensile strength of more than 1100 MPa after carburizing. Composite-type Cr containing alloyed steel powder, which contains prealloyed 1% Cr and composite-type alloyed 1% Mo to improve the compressibility of Cr-containing powders, attains a compressibility of 7.18 MPa, when pressed at 686 MPa, and higher tensile strength than that of KIP 4100V after bright-quenching at 1420 MPa. The wear resistance is comparable to that of KIP 4100V, and is more than one hundred times greater than that of Ni-containing composite-type alloyed steel powder. The sintering shrinkage of the composite-type Cr-containing alloyed steel powder is suppressed by transient liquid-phase sintering, and the dimensional change during sintering is very small.



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要旨

高強度、耐摩耗性機械部品用の鋼粉として、Cr 系合金鋼粉の

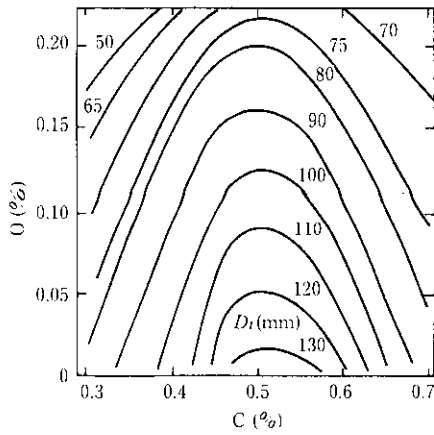


Fig. 1 Effect of C and O contents on ideal critical diameter D_1 of Cr containing powder-forged steels

Cr 系合金鋼粉では、圧縮性は鋼粉中の不純物元素である O, C および N 量の低減とともに向上する。一方, Cr は, Mn および Mo に次いで焼き入れ性を高める元素として, Mn とともに溶製鋼材に広く用いられている。Fig. 1 に Cr 系合金鋼粉の酸素量と添加黒鉛量とを変化させて得られた焼結鍛造材の焼き入れ性を表す理想臨界直径 D_1 を示す。いずれの要素でも理想臨界直径は酸素量の低

Table 1 C, O and N contents of KIP 4100V (%)

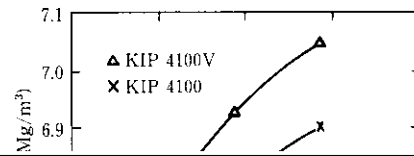
	O	C	N
KIP 4100V	0.10	0.02	0.001
KIP 4100	0.58	0.05	0.006

1523K で 60 min 焼結した。浸炭焼き入れはカーボンポテンシャル 0.7, 0.9 および 1.1% の条件で 1203K で 30 min 行い油中に焼き入れ後, 453K で 60 min 焼きもどした。

3.2 結果と考察

3.2.1 KIP 4100 V 鋼粉の圧縮性

KIP 4100 V 鋼粉の圧縮性を Fig. 2 に示す。従来のガス還元鋼粉 (KIP 4100) と比べ, O, C および N が低減され圧縮性が 0.14 Mg/m^3 向上した。



711-9 Cr 系合金鋼粉の特性

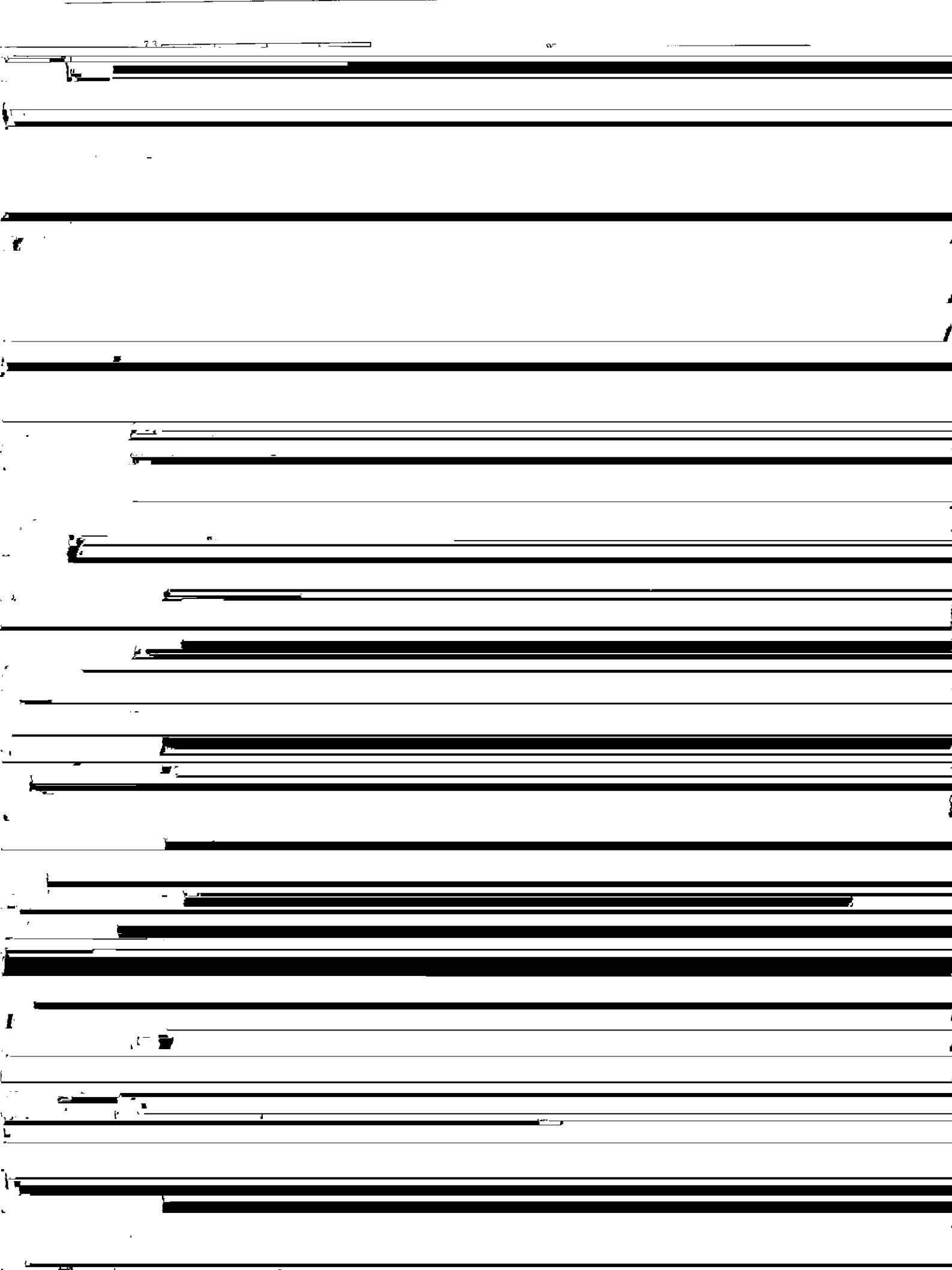


Table 6 Mechanical properties of sintered, carburized and tempered compacts

Powder	Tensile strength (MPa)	Absorbed energy (J)
A (1% Cr-1% Mo)	1120	9.4
B (1% Cr-0.3% Mo-0.7% Mn)	1100	7.6

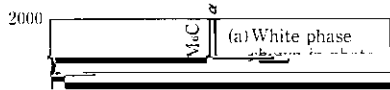
Table 7 Fatigue properties of sintered, carburized and tempered compacts

Powder	Sintered density (Me/μ^3)	Surface hardness (HRC)	Fatigue endurance limit (MPa)	
			Rotating	Contact

Table 8 Dimensional change of sintered compacts

Powder	Alloying method	Dimensional change (%)	Standard deviation of dimensional change (%)
A (1% Cr-1% Mo)	Modified composite-type	0.08	0.02
A (1% Cr-1% Mo)	Mixing	0.09	0.05
B (1% Cr-0.3% Mo-0.7% Mn)	Prealloying	-0.52	0.03

焼きもどし組織中に残留する軟らかく耐摩耗性の劣るオーステナイ



以上のように Cr 複合金鋼粉 A では遷移液相の出現により Mo の拡散および空孔の球状化がはかられ、焼結時の収縮が抑制され、