

Alloy for SOFC Interconnects **ZMG™232G10**

with improved oxidation resistance and electrical conductivity

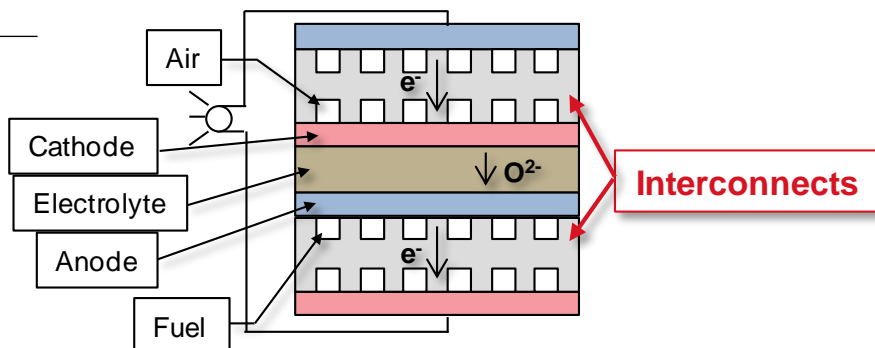
Sample available

1. Role of Metallic Interconnects

Electrical connection between cells

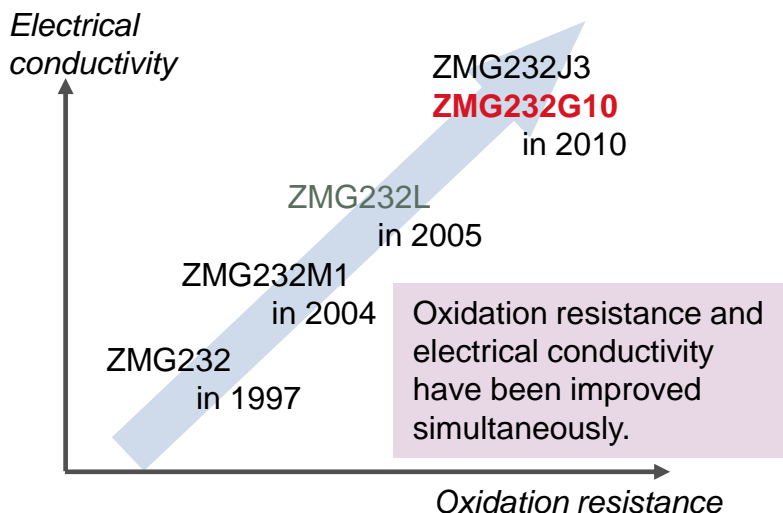
2. Required properties

- Good **long-term oxidation resistance**
- Good **electrical conductivity**
- **Thermal expansion** close to electrode materials (ceramics)

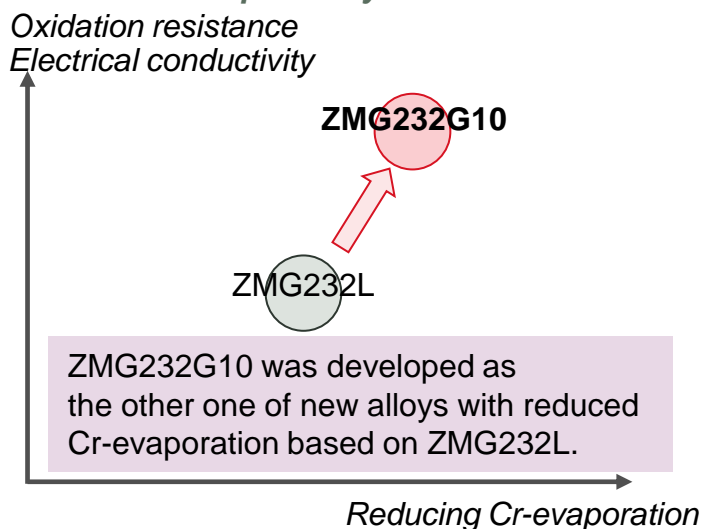


3. Developed Fe-Cr ferritic alloys ZMG232G10

- History of development



- Feature of developed alloys



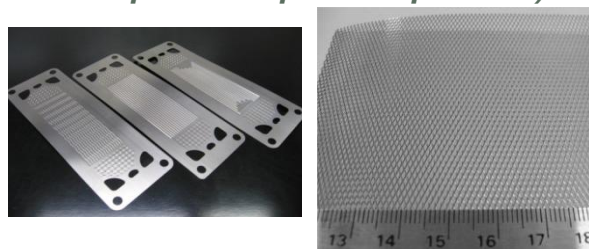
- Sheet stock

* Hitachi Metals Trading, Ltd. has inventories.

Thickness (mm)	Width (mm)	Length (mm)
0.1	300	600
0.3	300	600
0.5	300	600
1.0	300	600
2.0	300	600
3.0	300	600
15.0	300	1000

These can be quickly delivered.

- Appearance of metallic interconnects (an example of shaped components)



We can produce the shaped materials after ordered. (stamped metals, expanded metals, etc.)

4. Contact

[Asia, Japan]
Hitachi Metals Trading, Ltd.
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[North America]
Hitachi Metals America, Ltd.
Tel: +1-914-694-9200

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Properties in ZMG™232G10

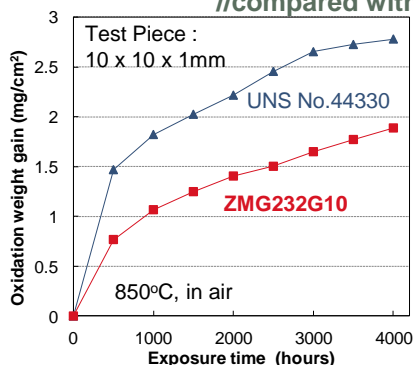
-Chemical compositions of evaluated alloys

	C	Si	Mn	Cr	Al	Zr	La	W	Cu	Fe	(mass%)
ZMG232L	0.02	0.1	0.5	22	0.1	0.25	0.07	-	-	bal.	Reducing Mn Increasing Cr
ZMG232G10	0.02	0.1	0.3	24	0.1	0.25	0.07	2	1	bal.	Adding W Adding Cu

--- for improving oxidation resistance
--- for reducing Cr-evaporation

- Oxidation resistance

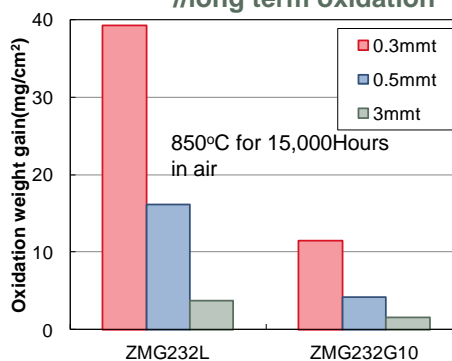
//compared with commercial alloy



- Oxidation resistance of our current alloy ZMG232G10 is better than 443ss.
- Oxidation weight gain of ZMG232G10 is increased with time under the parabolic relationship.

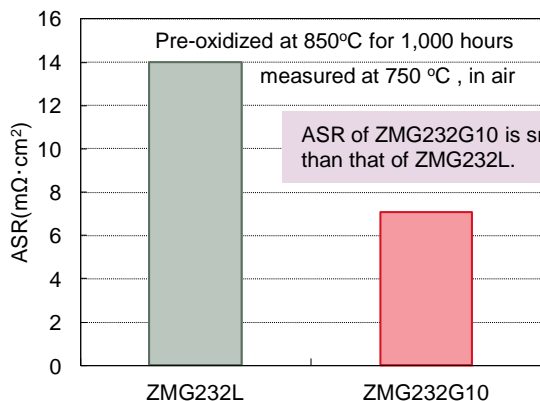
-Oxidation resistance

//long term oxidation



Oxidation weight gain of both thin sheet and bulk specimen of ZMG232G10 is smaller than that of ZMG232L.

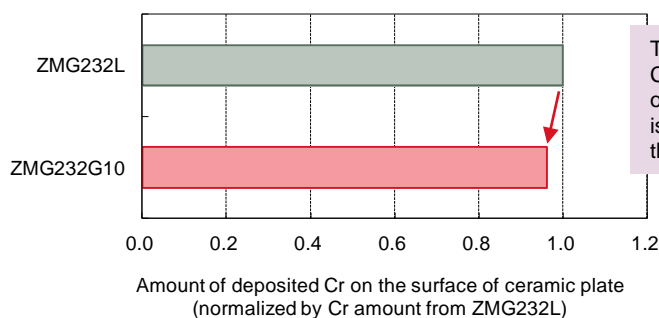
-Electrical contact resistance



ASR of ZMG232G10 is smaller than that of ZMG232L.

-Cr evaporation

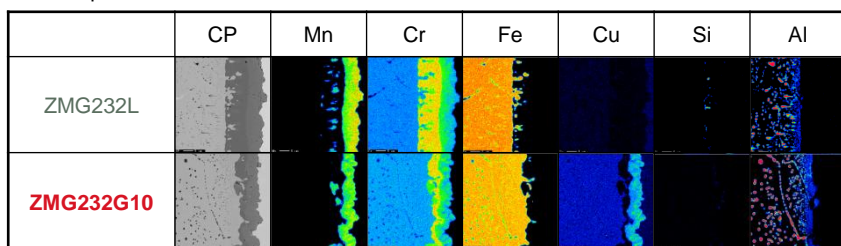
850°C x 30Hours, in air



The amount of Cr evaporation of ZMG232G10 is the smaller than that of ZMG232L.

-EPMA element map of the cross-sectional microstructure

-850°C for 10,000Hours, in air
-Test piece: 3mmt x 10mm x 10mm

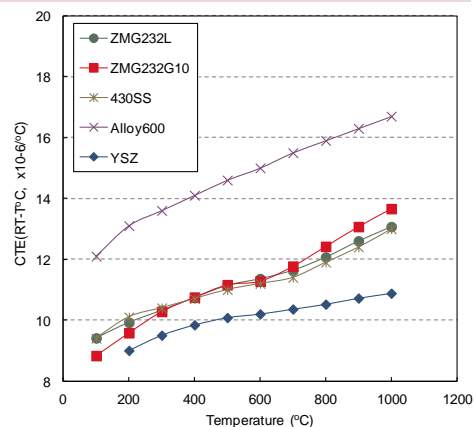


Alloy ← ↑ ↓ → Coated Ni for observation
Oxide scale

-Surface morphology : Alloy/(Cr₂O₃) / (Mn,Cr,Cu)₃O₄
-Oxide layer of ZMG232G10 is thinner than that of ZMG232L.

-Thermal expansion

Thermal expansion of ferritic alloys are close to electrode materials (ceramics).



- The properties mentioned in this document are typical values (The experimental values in our laboratory). Please be noted that such properties for the actual product may be different from the data sheet.
- This document includes the results of the research and development supported by New Energy and Industrial Technology Research Development Organization (NEDO).