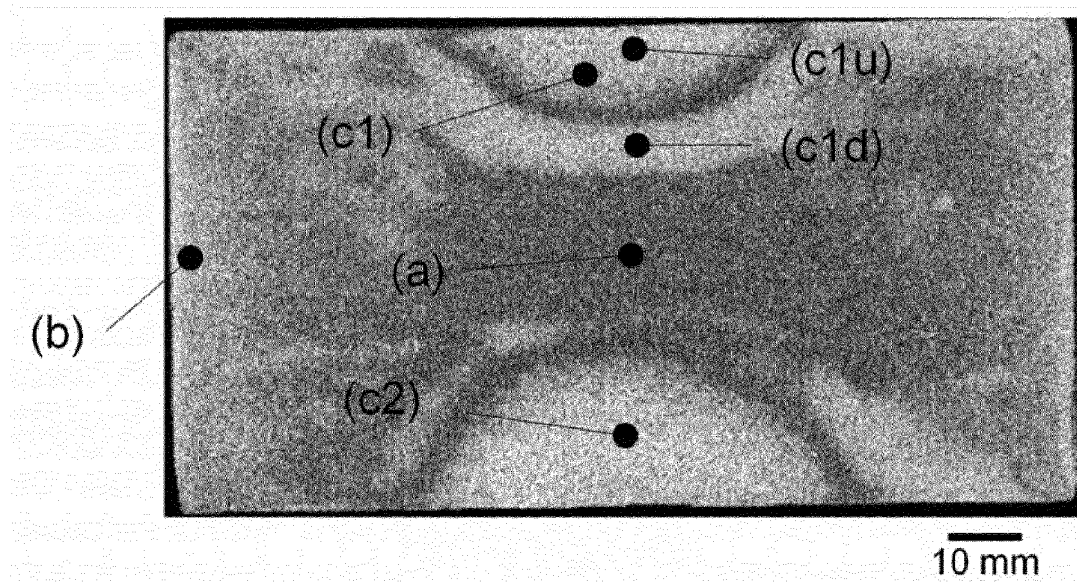
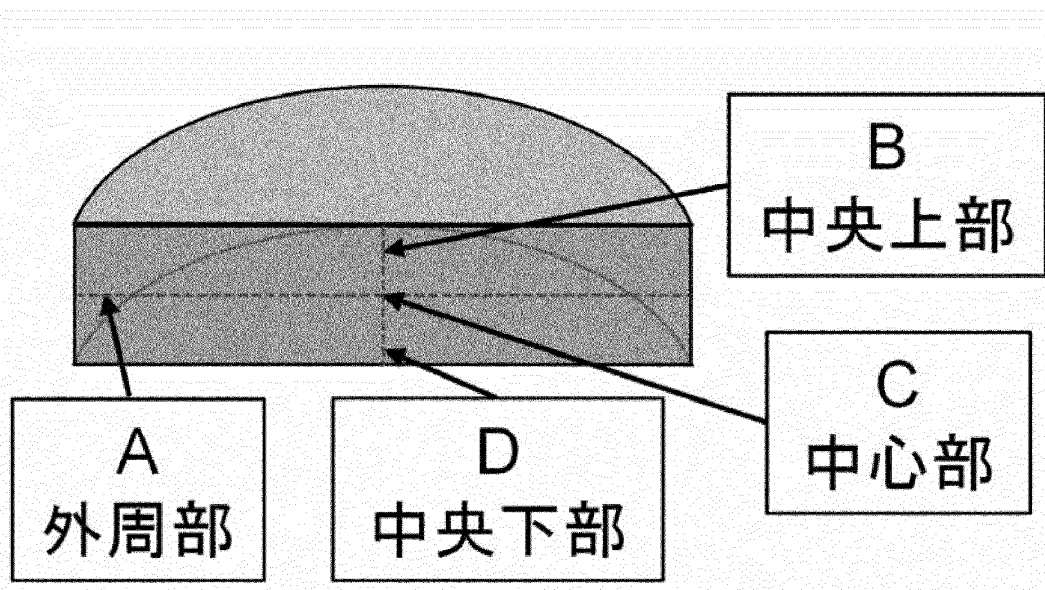


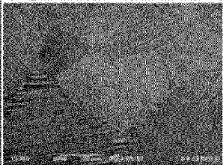
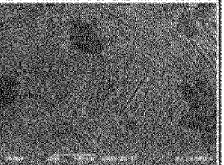
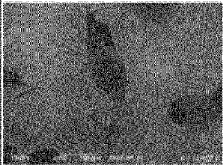
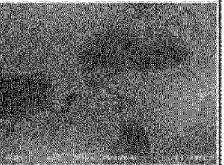
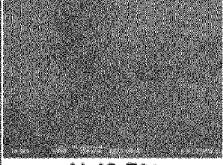
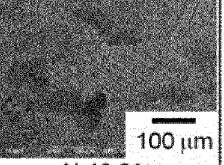
[図1]



[図2]



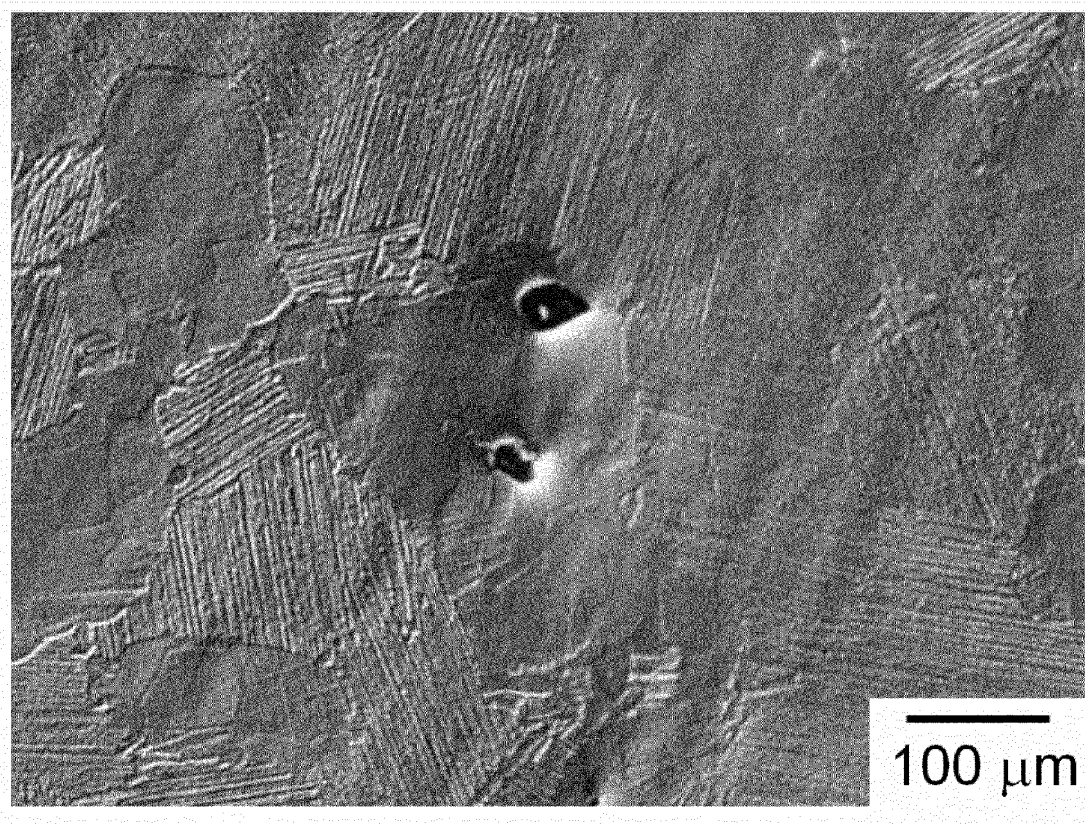
[図3]

| 試料 \ 位置                             | A                                                                                             | B                                                                                             | C                                                                                              | D                                                                                               |
|-------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| No.1<br>加熱途中での保持ナシ<br>(比較例1)        | <br>Al:43.1% | <br>Al:44.7% | <br>Al:47.2% | <br>Al:45.4% |
| No.2<br>600 °C x 1h<br>保持<br>(実施例)  | <br>Al:44.3% | <br>Al:44.6% | <br>Al:44.2% | <br>Al:44.8% |
| No.3<br>800 °C x 1h<br>保持<br>(比較例2) | <br>Al:43.7% | <br>Al:46.9% | <br>Al:48.1% | <br>Al:46.0% |

[図4]

|       | 原料粉末 | 焼結体の引張試験結果       |               |           |           | 評価     |
|-------|------|------------------|---------------|-----------|-----------|--------|
|       |      | 0.2% 耐力<br>(MPa) | 引張強さ<br>(MPa) | 伸び<br>(%) | 絞り<br>(%) |        |
| 実施例 1 | A    | 403              | 534           | 0.34      | 1.0       | ○ Good |
| 実施例 2 | B    | 452              | 535           | 0.28      | 1.0       | ○ Good |
| 比較例 3 | C    | —                | 435           | 0.08      | 0.5       | × Bad  |

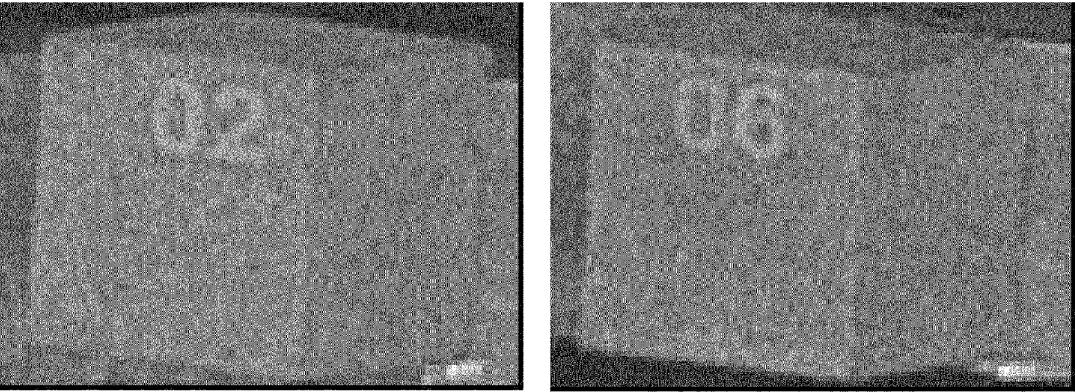
[図5]



[図6]

| 試料番号 |     | レーザー積層後<br>(仮焼結) | HIP 処理後<br>(最終焼結) |
|------|-----|------------------|-------------------|
| 0 2  | 寸法  | 10×10×10 mm      | 9.5×9.5×9.7mm     |
|      | 重量  | 3.54g            | 3.61g             |
|      | 空隙率 | 13.7%            | 0%                |
| 0 6  | 寸法  | 10×10×10 mm      | 9.3×9.3×9.2 mm    |
|      | 重量  | 3.10g            | 3.16g             |
|      | 空隙率 | 24.4%            | 0%                |

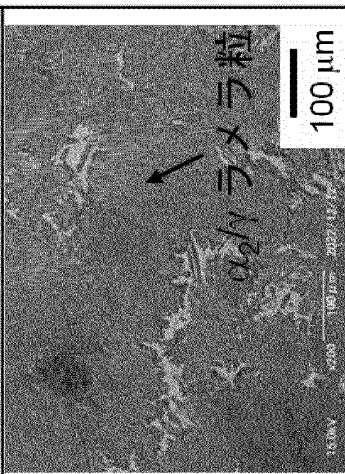
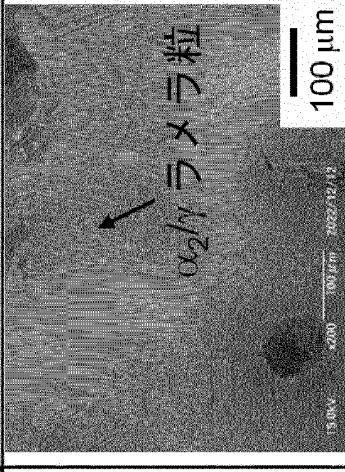
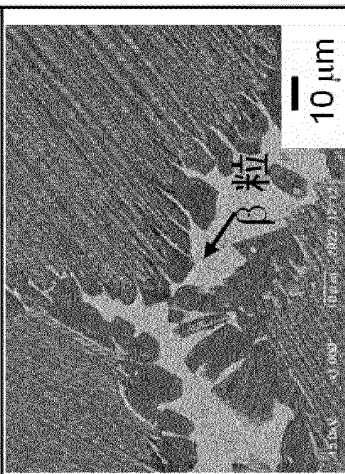
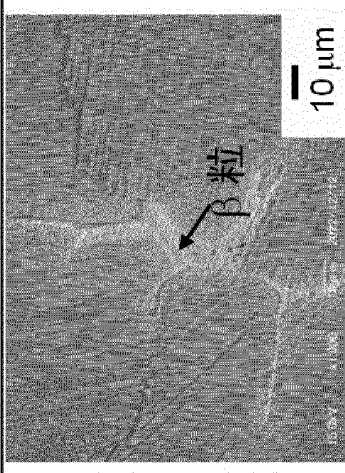
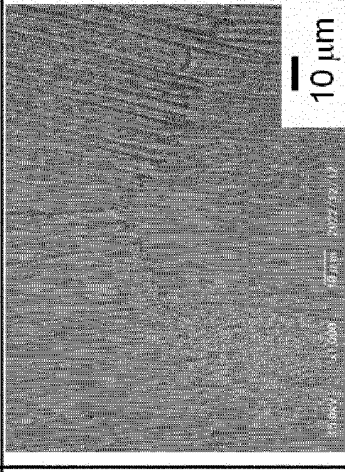
[図7]



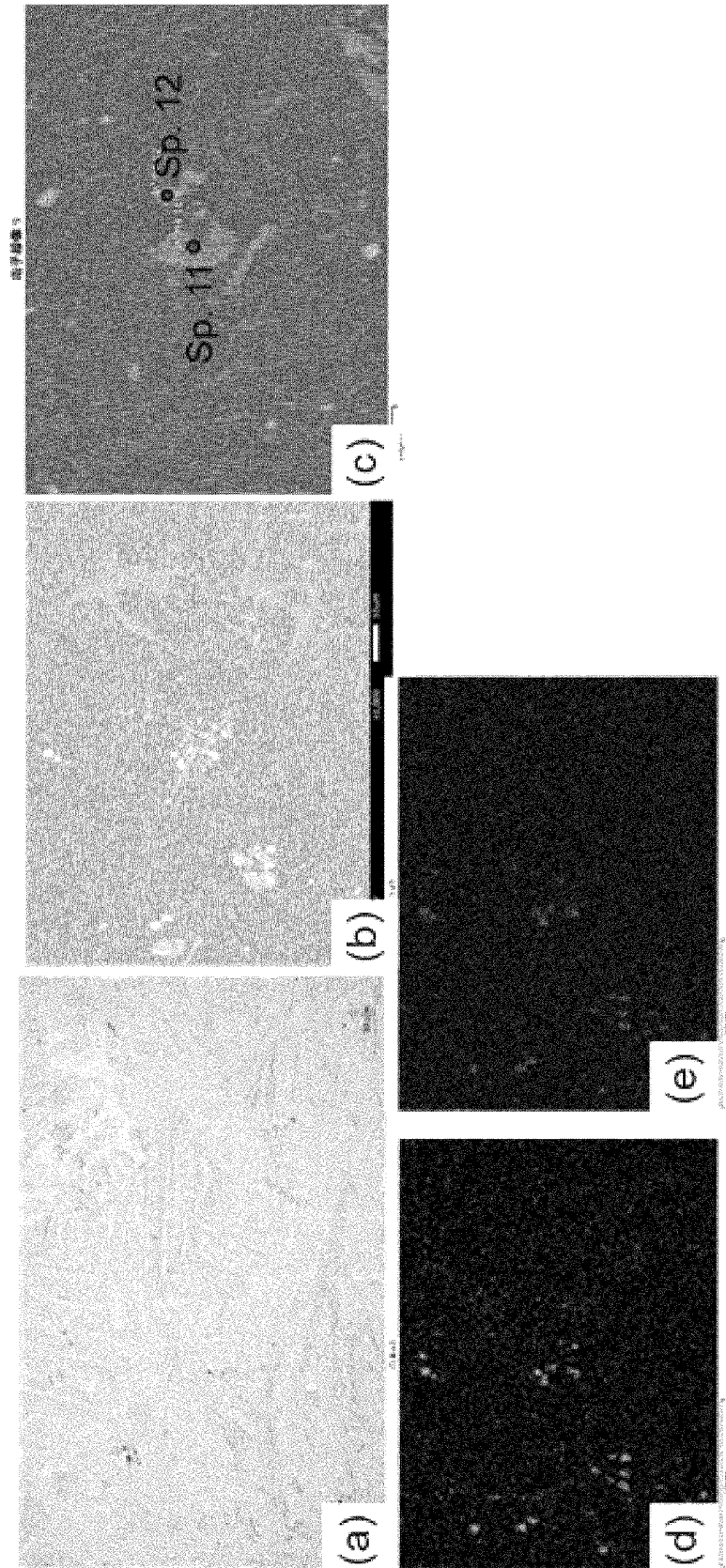
【図8】

|       | 冷却速度<br>(℃／min.) | 引張試験結果          |               |           |           |
|-------|------------------|-----------------|---------------|-----------|-----------|
|       |                  | 0.2%耐力<br>(MPa) | 引張強さ<br>(MPa) | 伸び<br>(%) | 絞り<br>(%) |
| 実施例 1 | 16.5             | 550             | 670           | 1.0       | 0.8       |
| 実施例 2 | 5.0              | 476             | 609           | 1.4       | 2.4       |

[図9]

| 組成<br>組成 | Ti: 55 at. %<br>Al: 45 at. %<br>Cr: 4 at. %<br>(実施例2)                                                                                                          | Ti: 55 at. %<br>Al: 45 at. %<br>Nb: 4 at. %<br>(実施例 1)                                                                                                          | Ti: 55 at. %<br>Al: 45 at. %<br>(比較例: $\beta$ 相なく粗粒化傾向)                                                                                                          |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | 低倍率の組織                                                                                                                                                         | 高倍率の組織                                                                                                                                                          | 高倍率の組織                                                                                                                                                           |
|          |  <p><math>\alpha_2/\gamma</math> ラメラ粒</p> <p>100 <math>\mu\text{m}</math></p> |  <p><math>\alpha_2/\gamma</math> ラメラ粒</p> <p>100 <math>\mu\text{m}</math></p> |  <p><math>\alpha_2/\gamma</math> ラメラ粒</p> <p>100 <math>\mu\text{m}</math></p> |
|          |  <p><math>\beta</math> 粒</p> <p>10 <math>\mu\text{m}</math></p>              |  <p><math>\beta</math> 粒</p> <p>10 <math>\mu\text{m}</math></p>              |  <p>10 <math>\mu\text{m}</math></p>                                          |

[図10]

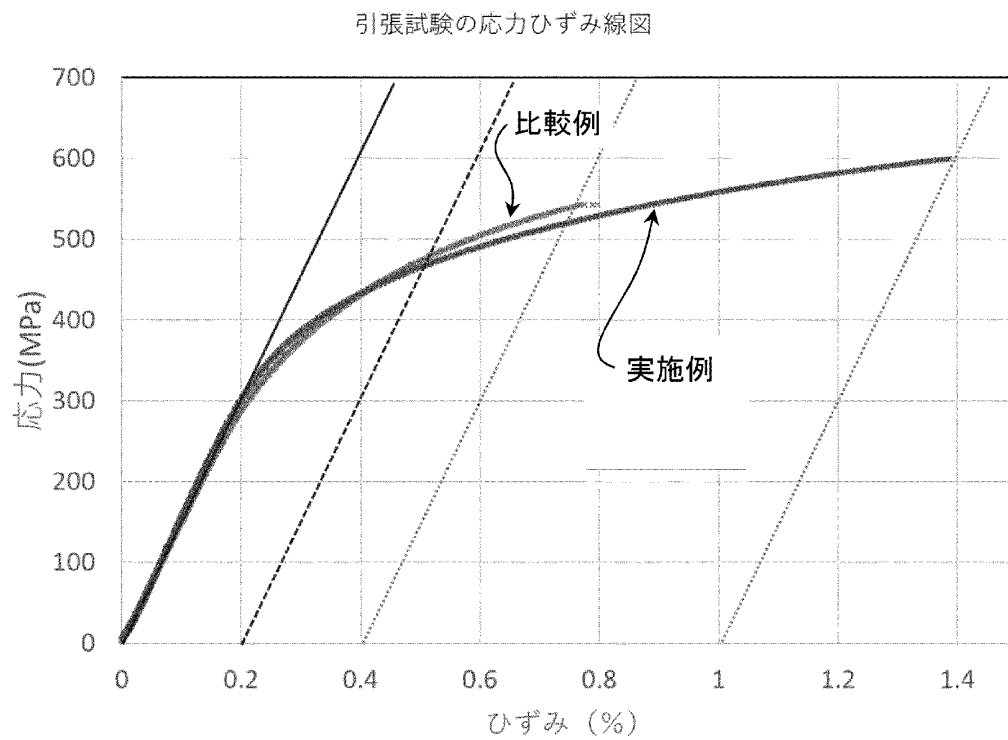


[図11]

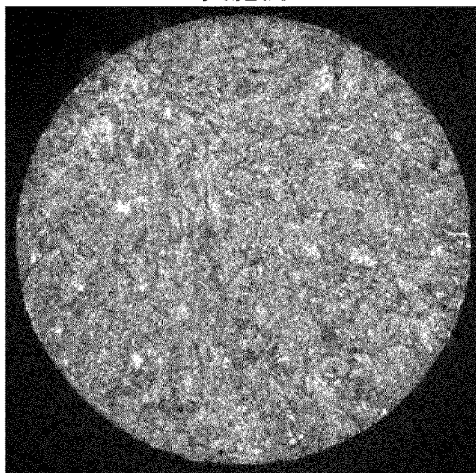
| Sp.11 | B     | Ti    | Nb   | W    | トータル | TiB <sub>2</sub> |
|-------|-------|-------|------|------|------|------------------|
| at%   | 62.31 | 29.11 | 4.49 | 4.08 | 100  |                  |

| Sp.12 | O     | Al   | Ti   | Nb   | La    | W    | トータル | LaO <sub>2</sub> 、<br>LaAlO <sub>3</sub> |
|-------|-------|------|------|------|-------|------|------|------------------------------------------|
| at%   | 59.49 | 6.06 | 6.31 | 0.28 | 27.68 | 0.19 | 100  |                                          |

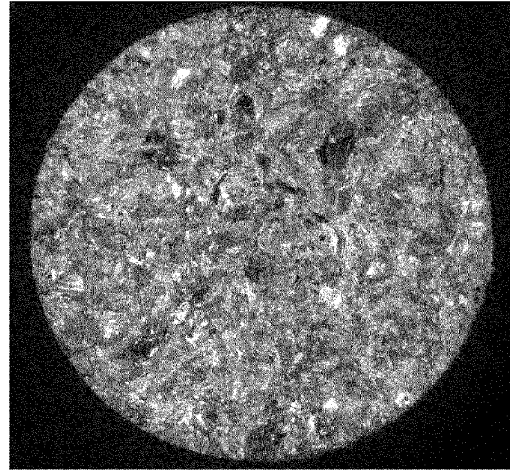
[図12]



実施例



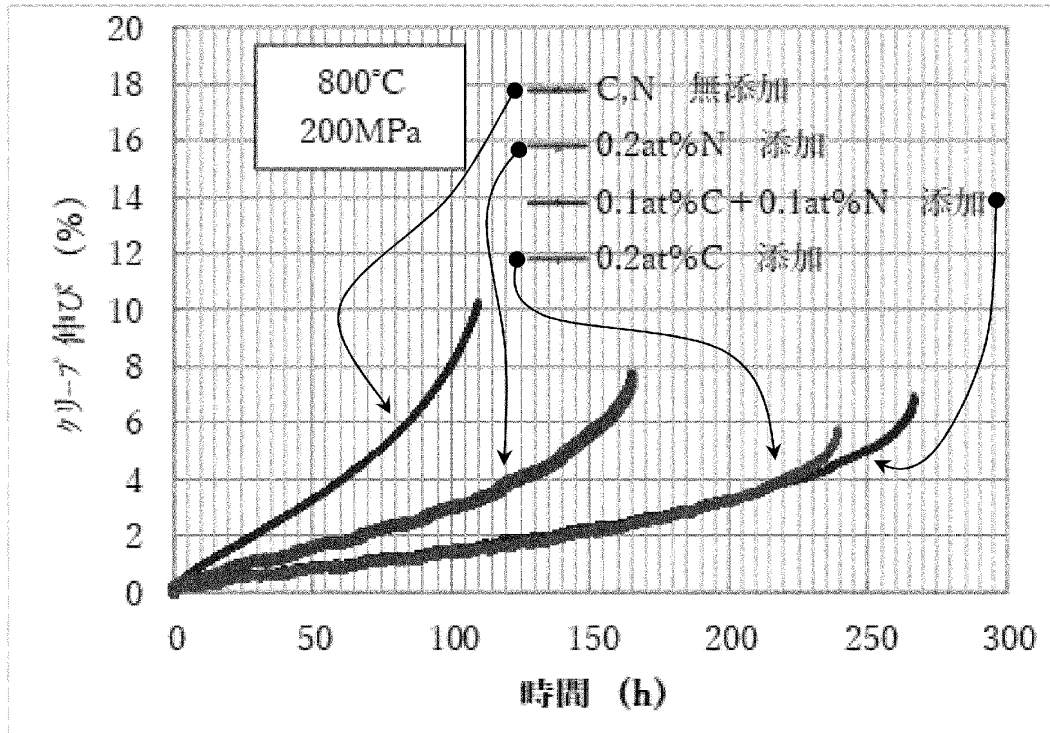
比較例



[図13]

|     | Al<br>at% | Cr<br>at% | Nb<br>at% | W<br>at% | La<br>at% | B<br>at% | O<br>at% | 縮小丸棒引張試験<br>引張強さ(TS)<br>破断伸び(E1) | 800℃-200MPa<br>クリープ試験結果                | 密度   |
|-----|-----------|-----------|-----------|----------|-----------|----------|----------|----------------------------------|----------------------------------------|------|
| 実施例 | 45.5      | 1.5       | 2         | 0.6      | 0.1       | 0.6      | 0.37     | TS:600MPa<br>E1:1.00%            | Life:36.6h,<br>ε <sub>R</sub> :18.2%   | 4.11 |
| 比較例 | 46        | 1.5       | 2         | 0.6      | 0         | 0        | 0.35     | TS: 543MPa<br>E1:0.43%           | Life : 95.5h,<br>ε <sub>R</sub> :12.6% | 4.11 |

[図14]



[図15]

|       | Al<br>at% | Cr<br>at% | Nb<br>at% | W<br>at% | La<br>at% | B<br>at% | N<br>at% | C<br>at% | O<br>at% | 室温引張試験<br>延性評価<br>(引張強さ × 破断伸び) | 800℃-200MPa<br>クリープ試験<br>破断寿命 | 密度   |
|-------|-----------|-----------|-----------|----------|-----------|----------|----------|----------|----------|---------------------------------|-------------------------------|------|
| 実施例 1 | 45.5      | 1.5       | 3         | 0.6      | -         | -        | 0.1      | 0.1      | 0.28     | Good                            | Very Good                     | 4.14 |
| 実施例 2 | 48        | 2         | 2         | -        | -         | -        | -        | -        | 0.34     | Good                            | Fair                          | 3.99 |
| 実施例 3 | 45.1      | 1.5       | 2.1       | 0.5      | 0.075     | 0.45     | -        | 0.15     | 0.33     | Very Good                       | Fair                          | 4.09 |
| 実施例 4 | 43.1      | 2.3       | 11.2      | 0.8      |           |          | 1.5      |          | 0.50     | Fair                            | Excellent                     | 4.59 |
| 比較例 1 | 43.5      | 0         | 4         | Mo:1     | 0.017     | 0.1      | -        |          | 0.62     | Poor                            | Good                          | 4.16 |
| 比較例 2 | 45.1      | 1.3       | 2.3       | 0.5      | 0.18      | 1.1      | -        | -        | 0.29     | Good                            | Poor                          | 4.10 |

Poor→Fair→Good→Very Good→Excellent

[図16]

