**Supplementary data**

**The chemical mixing enthalpy ( ΔHmixij ; kJ/mol) of binary equiatomic alloys calculated by Miedema’s approach.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Element** | **Al** | **Cu** | **Cr** | **Fe** | **Mn** | **W** |
| **Al** | 0 | -1 | -10 | -11 | -19 | -2 |
| **Cu** |  | 0 | 12 | 13 | 4 | 22 |
| **Cr** |  |  | 0 | -1 | 2 | 1 |
| **Fe** |  |  |  | 0 | -2.9 | 0 |
| **Mn** |  |  |  |  | 0 | 6 |
| **W** |  |  |  |  |  | 0 |

**SEM (EDS) Composition of AlCuCrFeMnWx High entropy alloys**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **AlCuCrFeMnWx** | **Phase** | **Al** | **Cu** | **Cr** | **Fe** | **Mn** | **W** |
| **X=0** | Ordered AlFeSigma PhaseFeMn Phase | 32.343.8811.13 | 14.1223.1310.18 | 8.1356.187.14 | 30.886.1335.12 | 13.125.8940.78 | 000 |
| **X=0.05** | Ordered AlFeSigma PhaseFeMn PhaseBCC Phase | 31.244.1812.1016.17 | 12.5222.1311.1912.19 | 7.1355.588.8410.89 | 31.687.1333.1212.89 | 12.124.8341.6816.67 | 3.122.784.8934.78 |
| **X=0.1** | Ordered AlFeSigma PhaseFeMn PhaseBCC Phase | 32.446.1812.1115.17 | 13.1222.1311.1012.19 | 8.1055.588.8410.80 | 30.786.1330.1211.89 | 12.124.8640.6116.87 | 6.105.797.8036.58 |
| **X=0.5** | Ordered AlFeSigma PhaseFeMn PhaseBCC Phase | 30.446.1810.1114.17 | 13.1221.1311.1012.19 | 6.1050.588.8810.80 | 30.786.1329.1210.89 | 12.124.8637.0114.27 | 10.1010.7911.8038.58 |

**TEM (EDS) Composition of AlCuCrFeMnWx High entropy alloys**

