



## Scandium (Sc<sup>21</sup>)

### Properties

Scandium is a silvery-white metal with an atomic mass of 44.96 u. Scandium has a density of 2.985 g/cm<sup>3</sup>, a melting point of 1541 °C and a resistivity of 56.2 μOhm cm. It is relatively soft and has a Brinell hardness of 736 – 1200 MPa.

Scandium is found predominantly in +3 oxidation state. Its standard electrode potential in respect to Sc<sup>+3</sup> is -2.02V. Scandium dissolves slowly in most dilute acids. Its abundance has been estimated to be from 18 to 25 parts per million in the Earth's crust, which is comparable to the abundance of cobalt (20-30 ppm).

### Plating Solutions

There are a number of metals with a Nernst potential well below that of water decomposition and that therefore cannot be electroplated from aqueous baths (e.g. aluminum, magnesium, tantalum and others). In such cases, electroplating of metals and alloys (including scandium) from ionic liquids can be used <sup>[1]</sup>.

Scandium can be also electrodeposited in the molten LiCl-KCl in the 400-550 °C temperature range <sup>[2]</sup>.

### Applications

The main application of scandium by weight is in aluminum-scandium alloys. These alloys contain between 0.1% and 0.5% of scandium. An aluminum-scandium alloy has been used in Russian MIG fighter planes, high-end bicycle frames, fishing rods, golf iron shafts and baseball bats. Scandium iodide is used in mercury vapor lamps, which are used to replicate sunlight in studios for the film and television industry. The radioactive isotope <sup>45</sup>Sc is used in oil refineries as a tracing agent.

### References:

1. F. Liu et al. *Journal of Alloys and Compounds* **654**, 163 – 170, 2016.
2. Y. Castrillejo et al. *Electrochimica Acta* **71**, 166-172, 2012.

***CONTACT NANO3D SYSTEMS LLC TO FORMULATE SCANDIUM PLATING SOLUTION  
PER YOUR REQUIREMENTS***