



Caesium (Cs⁵⁵)

Properties

Caesium is a silvery-golden, highly reactive alkaline metal with an atomic mass of 132.91 u. It has a density of 1.93 g/cm³, a melting point of 28.5 °C and a resistivity of 20.5 μOhm cm. It is soft and has a Brinell hardness of 0.14 MPa.

Similar to other alkaline metals, the free metal does not occur in nature. It is found as ion in the minerals pollucite and lepidolite. Caesium is not very abundant element in the Earth's crust and the abundance has been predicated to be 2-3 ppm. The most common oxidation state for Caesium is +1 but -1 was also has been reported^[1]. It is the most reactive metal and has the least electronegativity based on Linus Pauling's scale. It ignites spontaneously in air and reacts explosively with water even at low temperatures. Caesium metal is highly reducing, with the standard reduction potential for the Cs⁺/Cs couple being -3.026 volts.

Plating Solutions

Like other alkaline metals, Caesium is impossible to deposit electrochemically from aqueous solutions and ionic liquids are one of the only electrolytes usable.

- a) Example #1: Caesium can be plated from tri-1-butylmethylammonium bis((trifluoromethyl)sulfonyl)imide (Bu₃MeN-TFSI) ionic liquid with Cs⁺ salt at room temperature^[2].
- b) Example #2: Caesium-tin alloys can be plated from 1-butyl-1-methylpyrrolidinium bis(trifluoromethylsulfonyl)amide (BMPTFSA) ionic liquid with CsTFSA at room temperature and a current density of 0.1 mA/cm²^[3].

Applications

Caesium is of interest for its use in oil well drilling and completion fluids, electric power and electronics, as caesium-based cathodes in photoelectric cells, metal-ion catalysts for chemical synthesis.

References:

- [1] J. L. Dye. *Angew. Chemie Int. Ed. English* **18**(8), 587–598, 1979.
- [2] P. Y. Chen. *Electrochim. Acta* **52**, 5484-5492, 2007.
- [3] Y. Katayama, H. Murakami, K. Yoshill, and N. Tachikawa. *Electrochemistry communications* **84**, 61-64, 2017.

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PER YOUR REQUIREMENTS***