



Sodium (Na¹¹)

Properties

Sodium is a silvery-white, highly reactive alkaline metal with an atomic mass of 22.99 u. It has a density of 0.968 g/cm³, a melting point of 97.794 °C and a resistivity of 47.7 μOhm cm. It is soft and has a Brinell hardness of 0.69 MPa.

The most common oxidation state for sodium is +1 but -1 was also has been reported^[1]. It is generally less reactive than potassium and more reactive than lithium. Sodium metal is highly reducing, with the standard reduction potential for the Na⁺/Na couple being -2.71 volts, though potassium and lithium have even more negative potentials. The Earth's crust contains 2.27% sodium, making it the fifth most abundant metal, behind Al, Fe, Ca and Mg.

Plating Solutions

Sodium is similar to lithium and difficult to deposit electrochemically. Ionic liquids and molten salts are the only electrolytes usable. Sodium can be plated from Sodium bis(fluorosulfonyl)amide [FSA] salt in [C₂C1im][FSA] at room temperature and a current density of 1 mA/cm² ^[2]. Sodium-Lithium alloy could be deposited by mixing the ionic liquid, Trimethylbutylammonium bis(trifluoromethanesulfonyl)imide (TFSI), Li-TFSI and Na-TFSI at room temperature ^[3]. Lithium and sodium percentage can be easily change by changing current density. The alloys from 10% to 90% sodium could be plated using this method ^[3]. Sodium can be also deposited from a room temperature molten salt consisting of 1-methyl-3-ethylimidazolium chloride (MEIC) and AlCl₃ ^[4].

Applications

The deposition and re-oxidation of sodium metal is of interest for its potential use as the anode in sodium metal batteries. Sodium plasma ("vapor") lamps are often used for street lighting in cities, shedding light that ranges from yellow-orange to peach as the pressure increases.

References:

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