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ASTEROID MINING FOR NEODYMIUM AND OTHER TRIVALENT RARE EARTH METALS

Abstract

As Earth's resources are rapidly depleting, the idea of recovering valuable minerals from asteroids and returning them to Earth is becoming more appealing. Rare earth elements, particularly Neodymium, are our main emphasis. Permanent magnets made of neodymium, iron, and boron, often known as NIB magnets, are extremely powerful (used in computers, cell phones, medical equipment, motors, wind turbines and audio systems). This paper describes a series of processes and techniques for mining and extracting Neodymium and other rare earth metals from certain asteroids. To create sufficient force against the regolith, rock, or metal, mining on asteroids will require positive anchoring of the digger, drill, or cutting head. Neodymium extraction involves froth floatation followed by 10 percent HCL treatment, which leaves an insoluble residue (of about 70 percent rare earth metals). The trivalent rare earth elements are dissolved in this residue after it has been leached with HCL. Solvent extraction is used to separate the dissolved lanthanides from byproducts such as barite (BaSO_4), celestite (SrSO_4), and cerium concentrate. These methods are designed in such a manner so as to not exploit the resources inexorably and can thus be useful for all future dedicated asteroid missions to sustain our demands for rising technological advancements.