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Exploration and Utilization Prospects of Coastal Placer Deposits

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Coastal placer deposits are essential for strategic minerals such as tin, titanium, zirconium, gold, diamonds, and construction sand. More than 30 countries or regions are exploring and mining coastal placer mines and have established relatively mature commercial exploration and development models. Meanwhile, the impact of coastal placer mining on the environment attracts more attention. In terms of exploration, with the development of remote sensing technology, aerial and shipborne geophysical technology, underwater mobile detection technology, marine drilling technology, and big data fusion exploration technology, coastal placer mines have initially possessed the ability of satellite-air-sea-underwater integrated detection. For the mining aspect, large-scale mechanized and automated mining has been realized with the consideration of water and underwater collaborative development. In recent years, the newly developed mining and selection integrated ships have discovered electric, magnetic, and heavy joint selection, with high efficiency and significantly improved placer mining recovery rate. However, the mining activities also bring some unignored impacts on the surrounding environment, such as changes in terrain and landforms and the resulting biological effects. In the future, geophysical exploration methods may become dominant for exploring marine geological structures and energy resources and monitoring the environment, especially the seabed. Satellite, high-resolution aerial multi-parameter (magnetic, gravity, and deep electromagnetic) detection technology, and shipborne and underwater multidimensional (seismic, electromagnetic, magnetic, and gravity) detection technology will achieve high-precision detection and imaging of marine geological structures. Furthermore, intelligent detection platforms such as underwater submersibles adapted to deep-sea exploration will reach uninhabited detection. In terms of development, it is essential to establish low-disturbance and non-destructive mining modes, such as constructing a super-low ecological damage coastal mineral resource in situ development technology system, using high-precision sensors to achieve accurate identification of minerals and establishing onsite filling mining and selection technology and coastal wetland ecological restoration technology.