

## Mineral Sands Industry: Supply Highly Concentrated with Strong Pricing Discipline and Solid Growth Prospects; Compelling Investment Case for Selected Industry Players

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### EXECUTIVE SUMMARY

Heavy mineral sands (“HMS”) is a common term within the mining industry and geologic literature. It refers to layered sediments deposited along shorelines that contain dense minerals with economic value. Heavy minerals extracted from these coastal deposits contain titanium, zirconium, and rare earth elements **suitable for a wide variety of consumer and industrial applications** such as ceramics in the forms of wall and floor tiles as well as sanitary wares, foundry<sup>1</sup> for metal castings and integrated circuit manufacturing, pigment in paint and ink, and electronics for everyday life and defense products.

**Zircon and titanium minerals** are the two notable products taken from mineral sands deposits. Both of them have established multi-billion-dollar value chains with end products found in many goods that have become part of our everyday life as mentioned above. Among the components of heavy mineral sands, zircon has the highest market value, currently above US\$1,300 a tonne. Hence, zircon along with naturally occurring titanium materials such as rutile and ilmenite are determinants of the economics of mineral sands mining.

**Prospects of the mineral sands industry in general and zircon in particular are robust** in view of the anticipated persistently strong demand, driven by broad-based applications across multiple geographies. Specific growth drivers include:

- 1) **Growing urbanization around the globe, predominately in China and India**, with a respective 400 million and 215 million adding to the two countries’ urban population by 2025, in accordance with a recent research from McKinsey Global Institute;
- 2) **Adverse effects from trade conflicts between the U.S. and China have been relatively trivial in the zircon chemical segment** because of its unique consumption dynamics, as most of the associated applications are high-tech related like electronics, fiber optics and water treatments;
- 3) There is **no perfect replacement for zircon** in many applications stemming from its attributes such as high melting point and thermal conductivity, along with chemical stability at high temperatures; and
- 4) **Considerable number of novel applications developed** with expected widespread adoption will allow **zircon and its derivatives to play a more significant role in propelling technological advancements** in decades ahead by exploiting the advantages of nano-materials and nano-structures for various applications.

**Ceramics industry is the largest end market for zircon (in the forms of zircon opacifier and zircon flour), followed by foundry and refractory.** Specifically, ceramics industry consumes around 54% of zircon produced globally, while about 14% of zircon is used by the foundry industry, which is followed closely by the refractory industry with consumption accounting for about 11-14% of the total. The approximately 20% of share remaining is taken by other zircon-based applications such as medical implants, zirconia and zirconium-based chemicals (for pigments, electronics, catalysts, fiber optics, and water treatments), and extraction of zirconium metal (for corrosion-resistant alloys and nuclear reactor cores and rods).

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<sup>1</sup> A factory produces metal castings. Metals are cast into shapes by melting them into a liquid, pouring the metal into a mold, and removing the mold material after the metal has solidified as it cools. The factory can be used to fabricate integrated circuits too

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