



Remarks on Special Issue on Titanium

Ryuichi NAGAI

Executive Officer, Head of Titanium Unit

Titanium is a very young metal with an industrial history of only seventy-plus years because it took time to establish an industrial refining process after it was discovered at the end of the 18th century. Titanium has excellent characteristics such as light weight, high corrosion resistance, high specific strength, and low thermal expansion. Its various applications have been developed in the aerospace and infrastructure/industrial sectors such as chemistry/electrolysis, distilling, and power generation. Applications familiar to ordinary people, such as automobiles, watches, and golfing gear, have also been developed. In Japan, the aerospace industry—mainly military affairs—was strictly controlled after the Second World War; therefore, today applications of titanium are being developed in the non-military field, such as the infrastructure/industrial sector and sectors to produce consumer goods. The production scale has grown; Japan currently produces one-quarter of the world output of titanium sponge (material) and one-tenth of the world output of mill products (plates, bars, wires, and pipes).

Up until now, as Japan's largest and world-top-class comprehensive titanium mill product manufacturer, Nippon Steel Corporation has been developing innovative titanium production technologies by fully utilizing its production technologies and capability for research and development fostered by iron and steel making. Nippon Steel has also been improving technology development from the standpoint of users, such as its proprietary titanium products with new properties that satisfy customer needs and technologies for using and processing such products, contributing to expanding applications and the titanium market.

The threat of COVID-19, which spread across the globe in 2020, has been casting a shadow over the growth of the world economy. Japan unavoidably saw a remarkable decrease in the titanium mill product output in 2020, which was approximately two-thirds of that in 2018. The airline industry, which is one of the most severely affected industries, assumes that it will be around 2024 when the industry returns to the pre-COVID-19 scale. COVID-19's influence may still continue for some time. Meanwhile, when looking at the supply of titanium, China has become the world's largest titanium mill product manufacturing country due to the rapid increase in titanium mill product manufacturers in recent years. In order to continually grow in this harsh market environment with declining demand and increasing supply for titanium, innovation in production technologies and the application development of high-value-added products will become increasingly important.

With these issues in mind, Nippon Steel has been pursuing more efficient production technologies and developing applications in sectors with higher added values. This special issue introduces production technology development that we have worked on and our developed proprietary materials for the aircraft and automobile sectors. This issue also introduces developed

products (e.g., construction materials) in the high-value-added sector that can contribute to building national resilience as well as part of solution technology research and development. These developed technologies and products can also contribute to carbon neutrality, which will gain more attention in the context of environmental problems in the future and for which technological innovation is required.

I would be grateful if this issue provides enlightenment on the characteristics, fascination, and possibilities of titanium and that you find it useful.