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May 2023**

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“ADVANCING DIVERSITY”

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What do China's Curbs on Gallium and Germanium Mean for the World?

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With bipartisan consensus on China as America's existential threat, the United States has been relentless in all-out confrontation against China in a host of critical domains, including trade, semiconductor technology, ideology, the South China Sea, and Taiwan.

Beijing's tit-for-tat has so far been relatively restrained and non-effective until now. Beijing's latest curbs on two carefully-calibrated rare-earth elements (gallium and germanium) is a powerful shot across the bow that, short of a hot war, which both superpowers want to avoid, it has more coercive retaliatory armoury up its sleeve, regardless of collateral damage to the rest of the world as in the case of "de-risking" (or "de-coupling") from China.

Rare earths

According to an October 2020 research article in Foreign Policy Research Institute (FPRI), a nonpartisan Philadelphia-based U.S. think-tank, rare earths, a group of 17 elements, were first discovered and used in the United States, but production has gradually shifted to China, thanks to its lower labour costs, more lax environmental restrictions, and state subsidies. Now China accounts for 97% of global rare earth production.

* *Independent international strategist of China; he previously served as director general of social welfare and Hong Kong's official representative for the United Kingdom, Eastern Europe, Russia, Norway, and Switzerland.*

Gallium

95 per cent of all gallium produced is used to make gallium arsenide (GaAs), a compound used in microwave and infrared circuits, semiconductors, and blue and violet LEDs. The compound gallium nitride (GaN) is used as a semiconductor in Blu-ray technology, mobile phones, and pressure sensors for switches. Other uses include high-temperature thermometers, barometers, heat transfer systems and cooling and heating devices.

Germanium

Elemental germanium is used as a semiconductor in transistors and various other electronic devices. Historically, the first decade of semiconductor electronics was based entirely on germanium. Presently, the major end uses are fibre-optic systems, infrared optics, solar-cell

applications, light-emitting diodes (LEDs), polymerization catalysts and nanowires production.

Impact

The full impact of the gallium and germanium curbs appears not to have sunk in.

According to a Reuters report of 7 July, reactions from Volkswagen, TSMC, NXP Semiconductors, Microchip Technologies, Intel and other semiconductor businesses are relatively mild, if guarded.

These mild reactions, however, do not square with the abrupt hike of gallium price to \$326 a kilogram on 7 July, up \$43 from a week ago, in an early sign that buyers are seeking to shore up supplies before the export controls kick in next month. Germanium saw a much smaller impact, rising 1.9%, as highlighted in a Fortune report of 8 July.

Current global reserves of gallium metal are about 279,300 tons. China has the largest portion of these reserves at 68%, accounting for 98 % of worldwide primary low-purity gallium production in 2022. Foreign suppliers may struggle to secure sufficient quantities of gallium materials given the limited alternatives outside China, according to a report in the South China Morning Post of 4 July.

As for germanium, China's control around 60% of the global market, according to the European industry association Critical Raw Materials Alliance (CRMA).

The United States produces germanium and also has stocks (some 14 metric tons) under the control of the Defense Logistics Agency (DLA). The Agency has initiated a programme to recycle germanium scrap from decommissioned military equipment with a target of three metric tonnes per year.

However, the U.S. has no stockpiles of gallium and no primary sources, according to a Reuters report of 11 July.

Germanium is derived in two main ways, as a by-product of zinc production and from coal. These, respectively, account for about 75% and 25% of the total supply. China dominates germanium-from-zinc production. The U.S. is one of the alternative suppliers, with deposits in Alaska and Tennessee and additional refining capacity in Canada. But as it stands, the U.S. is still over 50% reliant on imported germanium.

Germanium from coal has several drawbacks. Two of the main producers are war-torn Russia and Ukraine. The other drawback is tightened supply as the world is phasing out environmentally-damaging coal power.

As it stands, the curbs look likely to sustain higher prices for gallium and germanium, as well as longer delivery times. This could make it more expensive and difficult for Western companies to produce electronic devices,

which could, in turn, lead to higher prices for consumers. It could also make it more difficult for Western companies to compete with Chinese companies.

Implications

While these two rare earth elements are important, they are the mere tip of a gigantic game-changing iceberg. Many rare earth elements are small yet critical components of a host of state-of-the-art gadgets, including electric vehicles as well as 21st-century weaponry. Electric vehicles, of course, are revolutionizing the world's entire automobile ecology. There is no prize for guessing which country is now becoming its centre of gravity.

According to the Baker Centre for Public Policy based in Tennessee, most future green technologies hinge on rare earth metals controlled by China, including solar panels, wind turbines and electric vehicles. Moreover, high-temperature magnets, the production of which China owns 100 per cent, is a major component of weapons systems.

According to a June 23, 2023 report in *Foreign Policy*, in the global scramble for rare earths, the elements behind F-35 fighter jets and missile guidance systems, China grabbed the baton in a relay race in the 1980s and bolted. The United States, once an industry leader, was left in the dust, along with the rest of the world. Eager to slash its reliance on Beijing, Washington has ramped up efforts to resurrect its own rare-earth industry. But even with this new momentum, experts say lawmakers remain stumped over how to counter China's economies of scale and plug a gaping expertise gap. Rare-earth mining is also notoriously dirty, and prospective U.S. companies must contend with lengthy regulatory and permitting processes.

Alarmed by China's curbs on germanium and gallium, the European Union is hastening to assess exposure, as reported in the *South China Morning Post* on 8 July.

Over the past four decades, China has assiduously been building an entire ecology, both national and international, of rare-earth at-scale extracting, processing, research, application, production, infrastructure, resources and expertise as part and parcel of its global manufacturing powerhouse. Any substantial "de-risking", not to mention "de-coupling", risks becoming a wild goose chase.

Nevertheless, except for defensive weaponry, China's rare earths are, for the vast part, used for transforming human lives in the 21st century, embracing a more sustainable future through a global green car revolution. President Xi's Global Development Initiative, Global Civilization Initiative and Global Security Initiative, all setting great stories on cooperative and inclusive development between nations, beg the question of the persistent narrative of spurious claims of "China Threat" and "China Risks".

Beijing's calibrated choice of curbing just two rare earth elements is a loud warning shot against United States' persistent no-holds-barred China-racking. Repeated rhetoric of not wanting to derail China's rise only reminds

Beijing of Michael Corleone's line in *The Godfather*, "*It's not personal. It's strictly business.*"

Beijing's recent willingness to talk to U.S. Secretary of State Antony Blinken, Treasury Secretary Janet Yellen, and other U.S. top envoys and officials suggests that while under no illusion of a U.S. rapprochement anytime soon, China at least is on the same page of maintaining dialogue where productive. Unless pushed into the last corner, Beijing is unlikely to weaponize the entire array of rare earths, mindful of collateral damage to many developing nations which remain more friendly disposed to China.

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