

USES FOR HEAVY RARE EARTH MINERALS

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Metal	Uses
Gadolinium	<ul style="list-style-type: none"> • used for making gadolinium yttrium garnets which have microwave applications • gadolinium compounds are used for making phosphors for colour TV tubes • alloys • CD disks • superconductive properties • solutions of gadolinium compounds are used as intravenous contrasts to enhance images in patients undergoing MRI (magnetic resonance imaging)
Terbium	<ul style="list-style-type: none"> • sodium terbium borate is as a laser material and emits coherent light at 5460Å • used to dope calcium fluoride, calcium tungstate, and strontium molybdate, used in solid-state devices • the oxide has potential as an activator for green phosphors used in colour TV tubes • used with ZrO₂ as a crystal stabilizer of fuel cells which operate at elevated temperature • alloys
Dysprosium	<ul style="list-style-type: none"> • its thermal neutron absorption cross-section and high melting point suggest metallurgical uses in nuclear control applications for alloying with special stainless steels • in combination with vanadium and other earth, dysprosium is used for making laser materials • dysprosium-cadmium chalcogenides are sources of infrared radiation and are used for studying chemical reactions • CD disks
Holmium	<ul style="list-style-type: none"> • alloys

Metal	Uses
Erbium	<ul style="list-style-type: none"> • nuclear industry • metallurgical uses. Added to vanadium, for example, erbium lowers hardness and improves workability • erbium oxide is pink and is a colorant in glasses and porcelain enamel glazes • photographic filter
Thulium	<ul style="list-style-type: none"> • Tm bombarded in a nuclear reactor can be used as a radiation source in portable X-ray equipment • natural thulium has possible use in ferrites (ceramic magnetic materials) used in microwave equipment • alloys
Ytterbium	<ul style="list-style-type: none"> • possible use in improving the grain refinement, strength, and other mechanical properties of stainless steel • one isotope apparently used as a radiation source as a substitute for a portable X-ray machine where electricity is unavailable • lasers
Lutetium	<ul style="list-style-type: none"> • stable lutetium nuclides can be used as catalysts in cracking, alkylation, hydrogenation, and polymerization • alloys