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ANNEXES 1 to 2

ANNEXES

to the Proposal for a COUNCIL RECOMMENDATION

on Advanced Materials

[Advanced Materials For Europe]

{SWD(2026) 833 final}

ANNEX I - Examples of advanced materials classes, non-exhaustive list.

Material classes	**Material examples**	**Typical properties**	**Application area examples** (across different sectors)
Advanced ceramics and glasses	Ceramic matrix composites, glass-ceramics, adsorbent materials.	Very hard inorganic, non-metallic materials with high temperature and corrosion resistance, often brittle.	High-performant gas turbines, engines and fuel cells, durable automotive brakes, lightweight heat shields in aerospace, durable medical implants or high-performance thermal imaging and night vision, replacement of hazardous materials (e.g. in wear-resistant coatings), high efficiency adsorbent materials to capture pollutants.
Advanced composites and hybrid materials	Carbon fibre reinforced, (bio)polymer matrix.	Strong and lightweight composed (mixed) materials with tailored properties.	Longer-lasting wind blades, light vehicles, dual-use aerostructures (transport aircraft, helicopters), space launcher and satellite structures, high-performant built structures and low-carbon building elements, robust pipes or high-performance body armour and protective gear, replacement of hazardous fibres in composites.
Advanced metals, alloys and semiconductors (as defined per Commission proposal COM(2026)504)	Superalloys, high-entropy alloys, lightweight metals/alloys, advanced steels.	Strong, (semi)conductive materials with high temperature, corrosion, fatigue resistance and enhanced properties.	More efficient robust gas/steam turbines, durable combustion engines, batteries, critical raw material-free permanent magnets, long-lasting medical implants, or high-performance protective armour, replacement of critical raw materials and hazardous materials (e.g. in wear-resistant coatings), dual-use space and defence systems.
Advanced polymers and precursors	Conductive, self-healing, shape-memory (bio)polymers, membranes.	Lightweight, flexible, adaptive and durable macromolecular materials with enhanced properties or functions.	Safer, more efficient and recyclable batteries (e.g., electrolytes, membranes), protective coatings, flexible wearables and displays, or innovative wound dressings and artificial tissues, replacement of hazardous lubricants / surfactants (e.g. PFAS), high-performance membranes for water purification.
Nanomaterials (as defined per Commission Recommendation 2022/C 229/01).	Nanoparticles, quantum dots, nanotubes, 2-dimensional materials (e.g. graphene).	Materials with structures at the nanoscale leading to peculiar properties, e.g. based on quantum effects.	More efficient solar cells, energy-harvesting windows, anodes and cathodes for batteries, self-healing concrete, low-power chips, quantum computing and sensors as contrast agents in medical imaging.
Smart and functional (intelligent/responsive) materials	Shape memory, piezoelectric, sensors.	Adaptive materials responsive to external stimuli.	More efficient energy harvesting, self-healing coatings, self-expanding medical implants or morphing aerospace structures, smart sensors for quality monitoring.
Stealth and metamaterials	Negative index materials, acoustic metamaterials, photonic crystals.	Artificially engineered structured materials with unique electromagnetic, optical, electrical or acoustic properties.	Stealth and camouflage, electromagnetic shielding, or high-efficiency antennas and wireless communication.

ANNEX II

Priority challenges

The process for identifying **priority challenges** should follow the existing governance structure of the Technology Council for Advanced Materials. Subgroups should be used for technical discussions, while high-level plenary meetings will endorse new priority challenges. Each priority challenge should be supported by an implementation plan for an initiative addressing the challenge, covering the full 'innovation to investment journey'. This plan should identify the relevant actors involved – including the EU, Member States and industry – as well as the available funding mechanisms and relevant human capital and skills needs.

A feedback mechanism could be established between the funded projects supporting the agreed actions and the Technology Council in order to monitor progress and, where relevant, further support the innovation to investment journey, while protecting business secrets, e.g. by sharing only what is strictly necessary or aggregating sensitive data where possible.

Possible priority challenges that the Technology Council could consider include the following:

Critical Raw Material-free permanent magnets for clean energy. The Union's clean energy future – from wind turbines to electric vehicles – depends on rare-earth-free magnets. Today China provides 100% of the EU's supply of heavy rare earth elements, creating supply chain vulnerabilities and geopolitical risks. By accelerating R&I into advanced materials with Critical Raw Material-free alternatives and scaling industrial deployment, we can cut dependency and boost European manufacturing jobs.

Low carbon binders for cement production. Cement is the world's most used building material, with annual production of around 30 billion tons, and its industry accounts for around 8% of global CO_2 emissions. A novel binder that releases no CO_2 during production and can be made at much lower temperatures could deliver major climate benefits.

Circular fibre reinforced composites. Fibre composites are essential for lightweight construction and energy efficiency, particularly in electric vehicles, aviation, rail and urban mobility. However, fibre-reinforced composites face high material and processing costs, limited scalability and major recycling gaps. Import dependency on key raw materials remains high, with carbon fibres sourced mainly from Japan and the USA. A circular European value chain for secondary carbon and glass fibres could strengthen industrial sovereignty.

PFAS-free materials and process chemistries for semiconductors and electronics manufacturing. The Union must lead in semiconductors free of per- and polyfluoralkyl substances (PFAS) to secure its technological sovereignty and green transition. PFAS known as persistent 'forever chemicals' – pose growing health and environmental risks. By investing in R&I, scaling production, and commercialising alternatives, the Union can ensure that its energy, mobility, and chips industry – critical for AI, quantum technologies, and defence – stays competitive, sustainable, and resilient.