

INDUSTRIAL MINERALS IN DAILY LIFE*

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Few of us realize the importance of industrial minerals in our everyday lives. Perhaps a trip through a normal working day will underscore our reliance upon these nonmetallic minerals. This article was written to emphasize how much our lives would change without ready and economical access to these fundamental constituents. The products that contain industrial minerals or require them in the manufacturing process are highlighted in bold face.

As we step out of bed in the morning, we place our feet on the **carpet**. (Calcium carbonate, or limestone, is used in the carpet backing.) We find our way to the kitchen and switch on the **electric light** and **coffee pot**, which are made of either glass or ceramics. (Both **glass** and **ceramics** are made entirely from industrial minerals: silica sand, limestone, talc, lithium, borates, soda ash, and feldspar.) As we enter the kitchen, we walk on **linoleum** (calcium carbonate, clay, and wollastonite) or **ceramic tile**.

While the coffee is brewing, we sit down to read the **newspaper**. At the same time, we remember that we have to take a trip, so we consult our **Official Airline Guide** and refer to the **Yellow Pages** of the phone book for the number of the airline. (All of these papers are filled with kaolin clay; limestone, sodium sulfate, lime, and soda ash are used to process them.)

The coffee is ready. We brown a slice of **toast** and sneak a piece of **cake** from last night's party. (Bakery items, such as **bread** and **cake icing**, contain gypsum.) The **plate** from which we are eating is composed of **glass**, **ceramics**, or **china**, a special form of ceramics. We might also have a full breakfast or contemplate what we'll have for lunch or dinner. All of the **food** that we eat relies on industrial minerals for its growth and production. (All **fertilizers** are composed of potash, phosphates, nitrogen, sulfur, and other minor minerals. The acidity of soils must be regulated with gypsum, limestone, or sulfur. In fact, without industrial minerals, there would be no modern agriculture.) One of the most basic **food additives** is an industrial mineral: salt. It is so basic that it was historically used as a medium of trade or payment, as implied in our word **salary**.

We now get ready for work. We brush our teeth with **toothpaste** (calcium carbonate [limestone] or sodium carbonate). Women might put on **lipstick** (calcium carbonate and talc) and **powder** (talcum); men may use **hair cream** (calcium carbonate). Other forms of **makeup** also contain industrial minerals. The **counter top** in the bathroom is **synthetic marble** or **synthetic onyx** (titanium dioxide, calcium carbonate, and alumina hydrate). Sinks, basins, toilets, and similar fixtures throughout the house are kept shiny with **cleansers** (silica, pumice, diatomite, feldspars, and limestone). Kitchen and bathroom tiles are installed and waterproofed with **putty** and **caulking compounds** (limestone and gypsum).

Before we leave, we brighten up our wardrobe with **jewelry**.



(All precious and semiprecious stones -- opal, amethyst, aquamarine, topaz, garnet, diamond, etc. -- are industrial minerals.) There is a less attractive task to do at the last minute: changing the **kitty litter** (attapulgite, montmorillonite, zeolites, diatomite, pumice, or volcanic ash).

As we walk outside, we make a mental note to fix the **composite roof**. (**Fiberglass** is composed of almost the same ingredients as regular glass: silica, borates, limestone, soda ash, and feldspar. Fiberglass and asphalt, along with lesser quantities of either talc, silica sand, or limestone, make up composition roofing.) As we get in the car, we plan planting and gardening projects for the evening. In addition to **fertilizers**, we need to buy **soil amendments** and **planting mixes**. (Vermiculite, perlite, gypsum, zeolites, or peat improve plant growth.)

Once we leave for work, we are surrounded by industrial minerals. Our **car** is composed of them, starting from the ground up. **Tires** contain clays and calcium carbonate, and **mag wheels** are made from dolomite and magnesium. All of the **glass** in the car is entirely made from minerals, as is the **fiberglass body** that is becoming popular on many models. Many **components** in the car are made of **composites**, which are usually combinations of **fiberglass** and **plastics**. (Plastics are made from calcium carbonate, wollastonite, mica, talc, clays, and silica.) As we drive to work, we benefit from numerous industrial minerals in the **bumpers**, **dashboard**, **radiator cap**, and **floor mats**, among others.

The **paint** that makes our car so attractive is mostly composed of industrial minerals: titanium dioxide, kaolin clays, calcium carbonate, micas, talc, silica, wollastonite, and others. In fact, all paints that we encounter today, from that on our house to the stripe down the middle of the road to the interior of our office and other buildings, are composed of industrial minerals.

Modern transportation is almost entirely reliant upon industrial minerals, and this does not stop with the car. **Gasoline** and **lubricants** depend on industrial minerals because the **drill bit** that

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originally discovered the crude oil was faced with industrial diamonds. **Drilling fluids**, used for ease of well drilling, are almost entirely made from barite, bentonite, attapulgite, mica, perlite, and others. Clays and zeolites are used in the catalytic cracking process to refine crude petroleum and produce gasoline and lubricants.

On our way to work, we don't think about it, but we are literally riding on industrial minerals. **Concrete pavement** is composed of **cement and aggregates**. Aggregates are themselves industrial minerals: sand and gravel or crushed stone, such as limestone, dolomite, granite, and lava. Cement is manufactured from limestone, gypsum, iron oxide, clays, and possibly pozzolan. Even **asphaltic pavement or blacktop** contains industrial minerals as aggregates.

The **building** we are about to enter is made from or of industrial minerals. If it is a **concrete, stone, or brick building**, it is entirely made from industrial minerals. There may be **steel structural members**; the steel production process requires fluorspar for fluxing, bentonite for pelletizing, and perhaps chromite for hardening. The making of steel requires the use of high-grade **refractory bricks and shapes** made from bauxite, chromite, zircon, silica, graphite, kyanite, andalusite, sillimanite, and clays. **Fiberglass batts** may be used for insulation in our office building, as they are in our home.

Inside the building, we are often enclosed by **wallboard or sheetrock** (gypsum with fire-retardant additives, such as clays, perlite, vermiculite, alumina hydrate, and borates), joined together with **joint cement** (gypsum, mica, clays, and calcium carbonates). The **plate-glass windows** are entirely made from industrial minerals. The **floors or decks** between floors are probably made from **concrete with lightweight aggregate** (perlite, vermiculite, zeolites, or expanded shales).

To begin our work, we may pick up a **pencil** (graphite and clays) to make a list of things to do. One of our first tasks is to mail a few invoices that are backed with **self-contained carbon paper** (bentonite or other clays or zeolites). We need to order some supplies, so we pick up a **catalog or magazine** and note the glossy feel of the **paper**, due to a high content of kaolin clay or calcium carbonate, and the extreme whiteness of the paper, due to titanium dioxide. Almost every sheet of paper that we use was made from industrial minerals, such as talc, or contains minerals as fillers and coaters. Even some **inks** contain calcium carbonate or other fillers.

The morning has worn on and it is time for a break. In addition to drinking coffee in a **coffee cup**, which is made of industrial minerals, we eat a roll that has been heated in the microwave on a **microwavable container** (plastics filled and reinforced with talc, calcium carbonate, and titanium dioxide or clays). While on break, we ponder what to do during the weekend. **Recreational devices**, such as **golf clubs, tennis rackets, fishing rods, and skis**, are commonly made from graphite or a slightly "older" material, fiberglass. **Backpacking equipment**, such as **pack frames, pots, and pans**, are made of **aluminum**. (All aluminum, for whatever use, originates with bauxite, one of the most widely used industrial minerals.) The **mantles** in camping lanterns are also made from an industrial mineral, thorium.

Communications equipment incorporates numerous industrial minerals. The standard product of the industry for many years has been the **silicon chip**, made from quartz or silica as the name implies. **Optical fibers**, made from glass, are replacing some copper wiring. The **television screen or computer monitor** is made of glass, but critical **tubes** also contain phosphors made from the rare earths or lanthanides, a family of industrial minerals. Even **superconducting materials** are made from industrial minerals (yttrium, lanthanides, titanium, zirconium, and barite).

After a hard day at the office, we stop for refreshments with our friends. A glass of **fruit juice** or, for the less temperate, **wine or beer**, would be refreshing. All of these liquids are filtered through either perlite or diatomite during the purifying and clarifying processes. If we add **sugar** to any of our drinks, we will enjoy the

States Collect \$481 Million for 1990 Share of Federal Mineral Revenues

The Minerals Management Service (MMS) of the U.S. Department of the Interior distributed \$481.3 million to 27 States last year. This total is the States' cumulative share of 1990 revenues from mineral extractions on Federal lands located within their borders and from Federal offshore oil and gas tracts adjacent to their shores. Most States share the revenues equally with the Federal government: 50 percent to the State, 40 percent to the Reclamation Fund for water projects, and 10 percent to the U.S. Treasury. One exception, Alaska, gets a 90-percent share, as prescribed by the Alaska Statehood Act. In 1990, five States -- Wyoming, New Mexico, Colorado, Utah, and California -- received more than 83 percent of the total revenues. Arizona received \$167,317.50, or 0.03 percent of the total.

benefits of industrial minerals because limestone and lime are basic to the production of **sweeteners**. Our refreshments may be served in **ceramic mugs or glasses**, which are composed entirely of industrial minerals.

Filtering and purification are major uses for industrial minerals. Drinking **water** is purified and clarified by filtering through limestone, lime, and salt. Wastewater-treatment plants use zeolites, soda ash, lime, and salt in the filtering process. **Vegetable oils** are filtered through clays, perlite, or diatomite. All of the minerals mentioned in this paragraph are used to filter and purify water in swimming pools.

After we return home, we may need to take **medicine or pharmaceuticals**. **Antacid pills** are essentially made from calcium carbonate. Other treatments for upset stomachs include **Milk of Magnesia** (made from magnesia or dolomite), **Kaopectate** (made from kaolin), and medicines made from clays, such as attapulgite. We ingest the **barium "cocktail,"** made from barite, prior to being X-rayed for gastrointestinal disorders. Iodine is used in **tincture of iodine** for cuts and bruises. **Lithium**, which is used to treat manic depression, is derived from an industrial mineral.

Abrasives are used for making **sandpaper** for home or workshop use, **emery boards** for our fingernails, and **polishing compounds** for our silverware and other items. Abrasives are made from pumice, diatomite, silica, garnet, corundum, and emery. **Porcelain figures** for our what-not shelves are made from silica, limestone, borates, and soda ash, and **plaster-of-paris statues** for our lawn are made from gypsum.

As a final testament to our dependence on industrial minerals, an ode to our lives will eventually be inscribed in the form of an elegy on **monumental stone**, made from marble or granite.

Great Basin Proceedings Now Available

Proceedings of the April 1990 symposium, "Geology and Ore Deposits of the Great Basin," held in Sparks and Reno, Nevada, are now available. The 1,257-page two-volume set includes 95 papers and costs \$95.00. The 1,000-page field-trip guidebook for this symposium contains 18 new and updated road logs, as well as new papers, and costs \$75.00. The 140-page program with abstracts contains 139 abstracts for all oral and poster presentations and costs \$10.00. All prices include shipping and handling. To obtain copies, send payment to the Geological Society of Nevada, P.O. Box 12021, Reno, NV 89510; tel: (702) 323-3500.