



## DEPARTMENT OF MINERALS

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### THE IMPORTANCE OF INDUSTRIAL MINERALS IN OUR EVERYDAY LIVES

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Few people realize the importance of industrial minerals in our everyday lives. Perhaps a trip through a normal working day will underscore our reliance upon these non-metallic minerals. The products that contain industrial minerals or utilize industrial minerals 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/limestone is used in the carpet backing). We find our way to the kitchen and switch the **electric light** and the **coffee pot**, which is 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 find we are now on **linoleum** (calcium carbonate, clay and wollastonite) or on **ceramic tile**.

While the coffee is being prepared we sit down to read the **newspaper** and at the same time we realize we have to take a trip today so we consult our **Official Airline Guide** and then have to refer to the **Yellow Pages** of the phone book for the number of the airline. (All of these papers are filled with kaolin clay and use limestone, sodium sulfate, lime and soda ash in the processing.)

The coffee is prepared and we have fixed a piece of **toast** and we sneak a piece of **cake** from last night's party (bakery items, such as bread, contain gypsum as an ingredient and cakes have a high content of gypsum in the icing.) The **plate** we are eating from is composed of **glass** or **ceramics** or **China**, the last being a special form of ceramics. We might also feel inclined to have a full breakfast and even contemplate what we'll have for lunch and what has to be prepared for the evening meal. Regardless, all of the food that we eat everyday relies completely on industrial minerals for its growth and production. (All **fertilizers** are composed of some combination 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 could not be any modern-day agriculture as we know it.)

Let's now start getting ready to go to work. We brush our teeth with **toothpaste** (calcium carbonate/limestone/sodium carbonate) and ladies put on **lipstick** (calcium carbonate and talc) and **powder** (talcum) and men might prepare their hair with **hair cream** (calcium carbonate). Other forms of **makeup** would have various minerals as a constituent. The **lavatory counter top** in the bathroom where we are standing is a nice **synthetic marble** or **synthetic onyx** (titanium dioxide, calcium carbonate and alumina hydrate). And, the **sinks, lavatories, 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 kept in place and maintain their waterproof condition with **putty and caulking compounds** (limestone and gypsum).

Just before we leave we want to brighten up our wardrobe with some form of **jewelry** (all precious and semi-precious stones - opal, amethyst, aquamarine, topaz, garnets, diamonds, etc., are industrial minerals). There is a less attractive task to do at the last minute, changing the **kitty litter** (attapulgit, montmorillonite, zeolites, diatomite, pumice or volcanic ash).

As we walk outside we make a mental note that we have to have the **composite roof** fixed. (**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, comprise composition roofing.) And, we are pleased to see that the **fiberglass siding** on our home that we have just installed looks so nice. As we get in the car we think that we will have to do **planting and gardening** this evening. In addition to **fertilizers** we will have to buy some **soil amendments** and **planting mixes** today. (Vermiculite, perlite, gypsum, zeolites or peat make for better growth.)

Once we leave for work we are really employing industrial minerals. Our **automobile** is literally composed of industrial minerals. Starting from the ground up, **tires** contain clays and calcium carbonate and the **mag wheels** are made from dolomite and magnesium. All of the **glass** in the car is made entirely from minerals as is the **fiberglass body** now becoming popular on many models. Many of the components in a car are now being made of **composites**, which are usually combinations of **fiberglass** and **plastics**. Plastics require calcium carbonate, wollastonite, mica, talc, clays and silica for their manufacture. So, as we drive to work, we are enjoying the value of numerous industrial minerals from the **bumpers** to the **dashboard** to the **radiator cap** and the **floor mats**.

The **paint** that makes our car so attractive is composed in large part from industrial minerals - titanium dioxide, kaolin clays, calcium carbonate, micas, talc, silica, wollastonite and others. In fact, every speck of **all paints** that we will encounter today, from that on our house, to the stripe down the middle of the road, to the interior of our offices and elsewhere, will be composed mainly of industrial minerals.

Modern transportation is almost entirely reliant upon industrial minerals and this does not stop with just the car. **Gasoline** and **lubricants** depend on industrial minerals since the **drill bit** that 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. It is necessary to employ clays and zeolites in the **catalytic cracking process** for crude petroleum to arrive at 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, lava, etc. **Cement** is manufactured from limestone, gypsum, iron oxide, clays and possibly pozzolan. Even **asphaltic pavement** or **blacktop** has industrial minerals as aggregates.

The **building** we are about to enter is made from or of industrial minerals. If it is a **concrete** or **stone** or **brick** building it is entirely made from industrial minerals. If there are **steel structural members** the steel production process required 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 buildings as they are in our homes.

Upon entering 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). Certainly the **plate glass windows** are entirely from industrial minerals. The **floors** or **decks** between floors will probably be made from concrete using **lightweight aggregate** (perlite, vermiculite, zeolites or expanded shales).

To begin our work we may pick up a **pencil** (graphite and clays) and make a list of things to do. One of the first items is to send out a few invoices that are backed with **self-contained carbon paper** (bentonite or other clays or zeolites). There are some articles to be ordered so we pick up a **catalog** or **magazine** and unconsciously

like the glossy feel of the **fine paper**, caused by a high content of kaolin clay or calcium carbonate along with titanium dioxide for extreme whiteness. Almost every **sheet of paper** that we use today will have used industrial minerals, such as talc, in its manufacturing process or will contain minerals as fillers and coaters. Even some **inks** will contain calcium carbonate or other fillers.

The morning has worn on and it is time for a break. In addition to the coffee in the **coffee cup** (remember it is made of industrial minerals), we decide to heat-up a roll and we place it in or on a **microwavable container** (plastics filled and reinforced with talc, calcium carbonate, titanium dioxide or clays.).

While on break, we commence to ponder what we will do for the weekend and know that there are a lot of **recreational devices** we would love to employ. These include **golf clubs, tennis rackets, fishing rods** and **skis**. All of these are now commonly made from graphite or, a slightly "older" material, fiberglass. Even if we are planning a backpacking trip our **pack frame** and **pots** and **pans** will be made of **aluminum** (all aluminum, for whatever usage, originates with bauxite, one of most widely utilized industrial minerals). If we use a camp light on our trip the **mantle** will be made from an industrial mineral, thorium.

**Communications equipment** employs 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 the **superconducting materials** that are presently getting so much attention utilize industrial minerals (yttrium, lanthanides, titanium, zirconium and barite) in their manufacture.

After a hard day at the office we drop in for refreshments with our friends. A **fruit juice** would be refreshing or for the less temperate a glass of **wine** or **beer**, but, all of these liquids use either perlite or diatomite as filter aids in their purifying and clarifying processes. If we should add **sugar** to any of our drinks we are enjoying the benefits of minerals since limestone and lime are basic to the production of sweeteners. And, of course, our refreshments will be served in **ceramic mugs** or **glasses** composed entirely of our friends the industrial minerals.

Filtering and purification are major duties of the industrial minerals. Our **drinking water** uses minerals for purifying and clarification (limestone, lime and salt) as do the **waste water treatment** plants (zeolites, soda ash, lime and salt). The **vegetable oils** we use are filtered using clays, perlite or diatomite. And, equally important to recreation is the utilization

of all of the minerals mentioned in this paragraph for the filter and purifying of water in **swimming pools**.

When we arrive back home we are not yet through with our exposure to our mineral friends. If we have to take **medicine** or **pharmaceuticals** we may chew **antacid pills** essentially made from calcium carbonate. For **upset stomachs** there are Milk Of Magnesia (magnesia/dolomite) or Kaopectate (kaolin) and others made from clays such as attapulgate. And, who can forget the lovely **barium "cocktail"** (barite), which is necessary to drink before getting x-rayed for gastrointestinal occurrences. Not to mention **tincture of iodine** (iodine) for all those cuts and bruises. And, the lithium that is used to treat **mental disorders** started out as an industrial mineral.

Rounding out the picture are such diverse uses as **abrasives** for **sandblasting** ships or for making **sandpaper** for home or workshop use as well as **emery boards** for our fingernails or **polishing compounds** for our silverware and other items. Abrasives are made from pumice, diatomite, silica, garnet, corundum and emery. Or, **porcelain figurines** (silica, limestone, borates, soda ash) for our what-not shelf and **plaster of paris statuettes** (gypsum) for our lawn.

Almost finally, it must be mentioned that one of the most basic **table ingredients** is an industrial mineral, namely salt. In fact it so basic that it was historically used as a medium of trade or payment as implied in our word "salary". And truly finally, an ode to our lives will be inscribed on **monumental stone** (marble or granite) in the form of an elegy.

The foregoing is meant to provide a broad insight into the importance of industrial minerals in our everyday life and to emphasize how much our lives would be altered without ready and economical access to these fundamental constituents.