

THE IMPORTANCE OF INDUSTRIAL MINERALS IN OUR EVERYDAY LIVES

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Few people realize the important role that industrial minerals play in our everyday lives. Perhaps a trip through a normal working day will help to 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. The industrial minerals that are used in each of the products discussed are underlined.

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** (silica sand and limestone in the glass globe) 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). When we enter the kitchen, we are standing on **linoleum** (calcium carbonate, clay, and wollastonite) or on **ceramic tile** (silica sand, limestone, clays). The ceramic tiles on the kitchen counter tops are installed and kept in place and maintain their waterproof condition with **putty and caulking compounds** (limestone, gypsum).

While the coffee is being prepared, we sit down to read the **newspaper** and at the same time we decide to plan for a vacation trip 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 the various kinds of **paper** are filled with and use limestone, sodium sulfate, lime and soda ash in the processing.)

The coffee is ready. To go with it, 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**. Limestone is used in the processing of **sugar**.) **The plate** we are eating from is composed of glass, ceramics or china (silica sand, limestone, feldspar, clay). While we munch, we might spend some time to contemplate what we'll have for lunch and what has to be prepared for the evening meal. Whatever we plan for the day's menu, all of the food that we eat every day is possible because of industrial minerals which make healthy growth and abundant production possible. **Fertilizers** are composed of such minerals as potash, phosphates, nitrites, borates, sulfur and other minerals. The acidity of soils must be regulated with **soil conditioners** such as gypsum, limestone or sulfur. In fact, without industrial minerals, there could not be any modern-day agriculture as we know it.

Let's now get ready to go to work. We brush our teeth with **toothpaste** (calcium carbonate, limestone, sodium carbonate, fluorite, barite). The ladies put on **lipstick and makeup** (calcium carbonate, talc, clay, mica) and men might prepare their hair with **hair cream** (calcium carbonate).

The lavatory counter top, and the other fixtures (**tub, shower, toilet**) in the bathroom where we are standing are **synthetic marble or synthetic onyx** (titanium dioxide, calcium carbonate and alumina), **fiberglass** (silica sand, colemantite, limestone, feldspar, soda ash), or ceramics. The fixtures are kept shiny and spotless using **cleansers** containing silica, pumice, diatomite, feldspars, and limestone.

As a finishing touch, we want to brighten up our wardrobe with some form of jewelry (all precious and semi-precious stones: opal, amethyst, aquamarine, topaz, garnet, diamond, etc. are industrial minerals).

Before we leave the house, we take a few minutes to straighten up a few items in disarray on the what-not shelf. The porcelain figurines on the shelf are made from silica, limestone, borates, and soda ash. There is one last unattractive task to do before we head for the office: Changing the cat's litter box! Kitty litter is composed of variations of attapulgite, montmorillonite, zeolite, diatomite, pumice, and volcanic ash.

As we walk outside, we make a mental note that we have to have the composite roof on the house fixed. The roof is composed mainly of fiberglass and asphalt with lesser amounts of talc, silica sand, and limestone. Fiberglass is composed of almost the same ingredients as regular glass: silica, borates, limestone, soda ash, and feldspar. We are pleased to see that the new fiberglass siding on our home looks so nice. There are some bare spots, we notice, in the flower bed in front of the house, so we will have to stop at the nursery on the way home and pick up some soil amendments and planting mix along with some new bedding plants. (Vermiculite, perlite, gypsum, zeolites, and peat are important for better plant growth.)

Once we leave for work, we are *really* putting industrial minerals to work for us. Our automobile is composed of an abundance of industrial minerals. Starting from the ground up, the tires contain clays, calcium carbonate, sulfur, and barite and the mag wheels are made from steel or aluminum alloys that contain dolomite and magnesium. All of the glass in the car is made from industrial minerals. The tinted windows may contain fluorspar. The car body and other components may be fiberglass or composite materials, which are usually combinations of fiberglass and plastics. Plastics require calcium carbonate, wollastonite, mica, talc, clays, and silica for their manufacture. The paint that makes our car so attractive is composed in large part of minerals - kaolin clays, calcium carbonate, micas, talc, silica, wollastonite and titanium dioxide. In fact, every ounce of any paint we use today, from that on our house, to the stripe down the middle of the highway, to the walls in the office, will be composed mainly of industrial minerals. So, as we drive to work, we are enjoying the benefits of numerous industrial minerals found in our cars from the bumpers to the dashboard to the radiator cap to the floor mats.

Modern transportation is generally reliant upon industrial minerals and this does not just stop with the car. Gasoline and lubricants depend on industrial minerals since the drill bit used to drill into the earth in the search for oil was very likely faced with industrial diamonds or tungsten carbide. Drilling fluids, when injected into an oil well, will help to prevent the well from caving and will help to cool the drill bit. The drilling fluids or muds are made almost exclusively of barite, bentonite, attapulgite, mica, perlite, and may contain other minerals, as well. It is necessary to employ clays or zeolites in the catalytic cracking process which will turn crude oil into products such as gasoline and lubricants.

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

The office building we are about to enter is constructed from a variety of industrial minerals. If it is a concrete or stone or brick building, it is built mostly of industrial minerals. If there are steel structural members used in the construction, the steel production process required fluorspar for fluxing, bentonite for pelletizing and, perhaps, chromite for hardening. The manufacture of steel requires the use of high grade refractory bricks and shapes (molds) made from bauxite, chromite, zircon, silica, graphite, kyanite, andalusite, sillimanite, and clays. Fiberglass batts may be used for insulation in office buildings as well as our homes.

When we enter the building, we are surrounded by **wallboard** or **sheetrock** which is made from gypsum and contains such **fire retardant additives** as clay, perlite, vermiculite, alumina hydrate, and borates. The wallboard sheets are joined together with **joint compound** which is made from gypsum, mica, clay, and calcium carbonate. The **plate glass windows** are made entirely from industrial minerals. The **floors or decks** between floors will probably be made from **lightweight aggregate** composed of perlite, vermiculite, zeolite, or expanded shale. The waste water from the restrooms and kitchen facilities is handled by **waste water treatment plants** that employ a wide variety of industrial minerals (zeolites, soda ash, lime, and salt).

Our work day begins! We may pick up a **pencil** (graphite and clays) and make out or list of things to do. One of the first items on the list is to send out a few invoices that are backed with **self-contained carbon paper** (bentonite or other clays and zeolites). There are some articles to be ordered so we pick up a **catalog or magazine** and unconsciously like the slick feel of the fine **glossy paper**, the result of 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 been manufactured using such industrial minerals as talc and will contain other minerals as fillers and coatings. Some of the **inks** used in the printing process will contain calcium carbonate or other mineral fillers.

The morning is worn on and it is time for a break. We add a packet of **sugar** (calcium carbonate or limestone is used in sugar refining) to our **cup** of coffee (remember the industrial minerals used in the manufacture of china and glassware?) and decide to heat up a cinnamon roll which we place in or on a **microwave container**. Microwave-safe containers are made of plastics filled or reinforced with talc, calcium carbonate, titanium dioxide, or clays.

While on break, our thoughts rove toward the weekend ahead and we think about all of the **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; older versions may be made of fiberglass. 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 the most widely utilized industrial minerals). If we use a gas lantern on the camping trip, the lamp's **mantle** will be made from the industrial mineral thorium. Maybe we'll just head for the community swimming pool for a few hours of splashing around. The clarity and purity of the water will be maintained by the use of **pool filter systems** made from diatomite, perlite, or clays.

Back to work! The constantly ringing telephone on our desk contains over 30 different minerals, including industrial minerals. All **communications equipment** contains components made from industrial minerals. The standard product for 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 copper wiring. The **screen** of our **computer monitor** is made from glass but critical **electronic tubes** also contain phosphors made from the rare earths or lanthanides, a family of industrial minerals. The new **superconducting materials** that are presently getting a lot of attention contain the industrial minerals yttrium, lanthanides, titanium, zirconium, and barite.

After a hard day at the office we drop in for refreshments with our friends. A nice cold glass of **apple or cranberry juice** would be refreshing, or, for the less temperate, a glass of **wine or beer**. All of these liquids are filtered or clarified using diatomite or perlite. Of course, our drinks are being served in **ceramic mugs or glasses** made of our friends, the industrial minerals.

When we arrive back home, we are not yet through with our exposure to industrial minerals. The evening meal wouldn't be complete without one of our most commonly used **seasonings**, an industrial mineral known as halite (table salt). Salt is so basic to our diet and existence that it was used, historically, as a medium of trade or payment as can be implied by our word "salary". That glass of **water** we're enjoying with dinner is purified using industrial minerals (limestone, lime, and salt). The vegetable oil in the salad dressing was made crystal clear through the use of **mineral filters** (clay, diatomite, or perlite). After a spicy dinner, we may chew on a few **antacid tablets** containing calcium carbonate or we may resort to that bottle of **Milk of Magnesia** (magnesia/dolomite) or **Kaopectate®** (kaolin) for relief of the upset stomach. Other **antacids** may be made from clay minerals such as attapulgite. (If the antacids don't work, that might mean a trip to the doctor and another use of industrial minerals. The "wonderful" **barium cocktail** that is used for gastrointestinal x-ray photography is made from the industrial mineral barite.)

After dinner, we decide to spend a little time in the garage workshop. We do a little sanding on that table we're building using **sandpaper** that contains garnet, quartz, or corundum. We **polish** some metal objects using mild abrasives as diatomite. We wash our hands with **Lava® hand soap** that contains pumice. We treat a minor cut with **tincture of iodine** that is made from iodine-bearing industrial minerals. We complete our hand and nail care using an **emery board** that contains fine garnet or silica grit.

We finish off our day with a few moments spent relaxing in the back yard where we admire our landscaping efforts. The **plaster of paris birdbath** on the back lawn is made from gypsum.

Whether it be for construction of our homes or offices and the furnishings within, things we use in work or recreation, medicines we take for our ailments (for example, **antidepressant drugs** which contain lithium), or a **monument** that marks our final resting place made from granite or marble, industrial minerals will be there.

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.