Identify Metals

by tranoxx on November 20, 2010

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Intro: Identify Metals

If your like me and make scrap metal sculpture then it can sometimes be hard to identify what metal the scrap is made of. In this instructable I will show you how too identify some of the more common metals. NOTE: These are not all the metals there are, there are thousands and I couldn't possibly tell about all of them.

Image Notes
1. I did not make this, Lewis Tardy did.
2. titanium

Image Notes
1. AHHHH what can I use?

Step 1: Ferrous or Nonferrous?

Ferrous means that the metal has iron content which in most cases makes it magnetic and nonferrous means it doesn't have iron in it. An example of a ferrous metal is mild steel, also known as low carbon steel. An example of a nonferrous metal is copper or aluminum. Its always a good idea to bring a magnet to the scrap yard.

Step 2: Aluminum

Aluminum is a shiny grey metal and has a clear oxide that forms on contact with air. This may not be the best thing for identifying it, but aluminums melting point is 658° C (1217°F). Also aluminum is non sparking. Aluminums density is 2.70 g/cm3, this is a good way to identify it because you can find the density of a material by density = mass ÷ volume. As i said earlier, aluminum is nonferrous.

Image Notes
1. Aluminum!

Step 3: Bronze

Most bronze is an alloy of copper and tin, but architectural bronze actually has a small amount of lead in it. Bronze has a dark coppery color and gets a green oxide over a period of time. bronze's melting point is 850-1000°C (1562-1832°F) depending on how much of each metal is in it. Bronze is nonferrous. Because bronze is an alloy densities vary. Bronze vibrates like a bell when hit.

Image Notes
1. Bronze sculpture

Step 4: Brass

Brass is another copper alloy but it has zinc instead of tin. Brass has a yellow gold color. Brass' melting point is 900-940°C (1652-1724°F) depending on how much of each metal they used. Brass is nonferrous. Because brass is an alloy its density varies. If hit brass vibrates like a bell, this can be used to determine if something is brass instead of gold.

Image Notes
1. Brass Baratone (or tuba im not sure).

Step 5: Chromium

Chromium is a very shiny silver color and forms a clear oxide over time. Chromiums melting point is 1615°C (3034°F). Things are rarely made of pure chromium but lots of things are coated with it to make it shiny and not rust. Chromiums density is 7.2 g/cm3. Chromium is nonferrous.

Image Notes
1. shiny!
2. chromium in crystalline form

Step 6: Copper

Copper is made into many alloys like brass and bronze. Copper is light red in color and gets a green oxide over time. Copper is nonferrous. Coppers melting point is 1083°C (1981°F). Coppers density is 8.94 g/cm3. Copper, like brass, also vibrates like a bell when hit.

Step 7: Gold

Gold is a shiny yellow color and does not have an oxide. Golds melting point is 1064.18°C (1947.52°F). Gold is very soft and is very heavy. Gold has a high electrical conductivity (more electricity can pass through it) which means that the connectors on many cords have gold plating. Golds density is 19.30 g/cm^3. Gold is nonferrous. Gold is a "precious" metal which means that it is very expensive and is used in coins and jewelry.

Image Notes
1. gold ingots

Image Notes
1. Lots of gold coins.

Step 8: Iron

Iron is ferrous (finally!) and magnetic. Iron is a dull grey when unpolished and its rust is a reddish color. Iron is also used in a lot of alloys like steel. Irons melting point is 1530°C (2786°F). Irons density is 7.87 g/cm3.

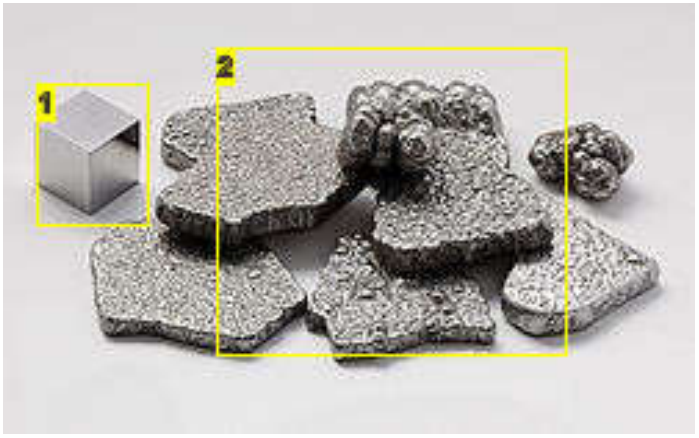

Image Notes
1. polished
2. unpolished

Step 9: Lead

Lead is a dull grey when unpolished but shinier when polished. Lead has a relatively low melting point, 327°C (621°F). Lead is nonferrous. Leads is very heavy, its density is 10.6 g/cm3.

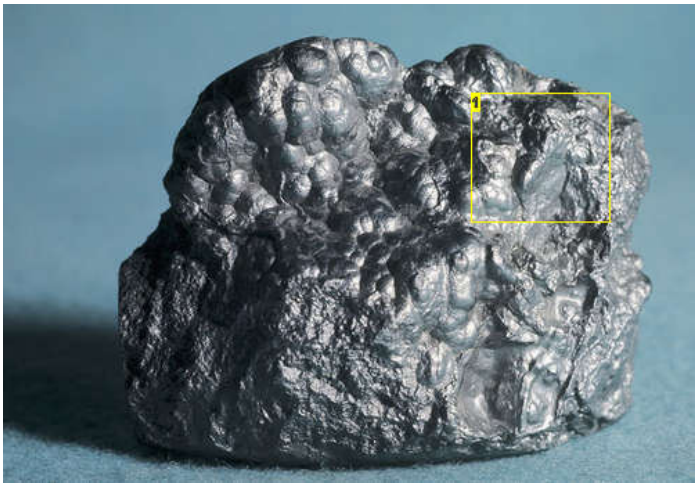

Image Notes
1. unpolished lead

Step 10: Magnesium

Magnesium has a grey color and develops an oxide that dulls the color. Magnesiums melting point is 650°C (1202°F). Magnesium is extremely flammable in a powder or thin strips. Magnesium burns very brightly and is very hard to put out because it is so hot that if you throw water on it, it separates it into hydrogen and oxygen, two very flammable gasses. Magnesium can also burn without oxygen making it even harder to put out. Magnesium is very light with a density of 1.738 g/cm^3. Because magnesium is so light it is used in engin blocks in cars, and because it burns so brightly it is used in incendiary weaponry (to incinerate things) and fireworks.

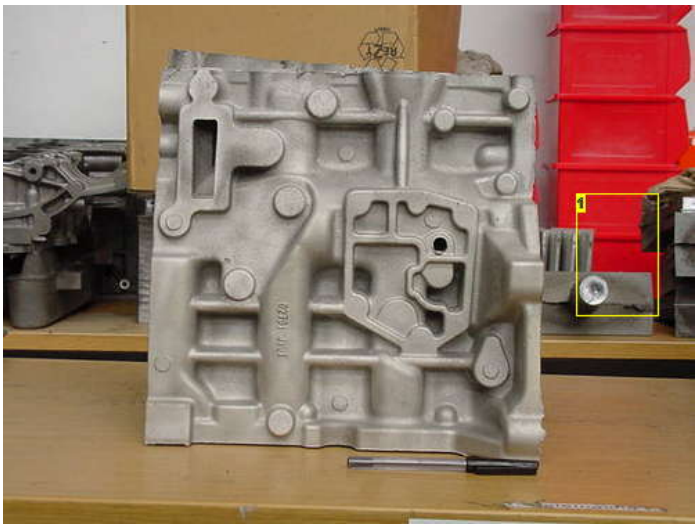

Image Notes
1. A magnesium engine block.

Step 11: Mild Steel

Mild steel is black to dark grey unpolished and silvery polished. Mild steel has the same red rust oxide as iron. Mild steel is also ferrous and magnetic. Another name for mild steel is low carbon steel. Mild steel makes yellow sparks when ground down. Mild steels density is about 7.86 g/cm3but it varies since it is an alloy of iron and carbon (low carbon steel). MIld steel melting point is 1350-1530°C (2462-2786°F).

Image Notes
1. polished

Step 12: Nickel

Nickel is shiny silver when polished and is darker unpolished. NIckel is one of the few metals that is not an iron alloy that is magnetic (5¢ US nickels are not magnetic because there made of a copper nickel alloy). Nickels melting point is 1452°C (2645°F). Nickels density is 8.902 g/cm3.

Image Notes
1. shiny!

Step 13: Stainless Steel

Stainless steel is a shiny silver color and does not forme and oxide. Chromium (step5) is mixed into the steel, when it hardens the chromium leaves a coating of its oxide on top of the steel, this is too thin to see so the steels color shows through. Stainless steels melting point is from 1400-1450 °C (2552-2642 °F). Stainless steels density varies because it is an alloy. Depending on the alloy some stainless steels are magnetic, but all are ferrous.

Image Notes
1. a stainless steel pot

Step 14: Tin

Tin is silvery grey in color (like most metals) when polished and darker when unpolished. Tin has a comparatively low melting point of 231°C (449°F). Tins density is 7.365 g/cm3. Tin is nonferrous

Image Notes
1. Polished
2. unpolished

Step 15: Titanium

Titanium is a silvery grey metal metal when unpolished and darker when unpolished. Titanium gives off bright white sparks when it is ground. Titanium is nonferrous. Titaniums melting point is 1795°C (3263°F). Titaniums density is 4.506 g/cm3.

Image Notes
1. titanium in crystalline form

Step 16: Silver

Silver is a shiny grey even before being polished but develops a black film over time and has to be polished. Silvers melting point is 961.78°C (1763.2°F). Silver has the highest electrical conductivity (more electricity can pass through it) than any other metal. Silvers density is 10.49 g/cm^3. Silver is nonferrous. Silver is a "precious" metal meaning that it is expensive and is used in coins and jewlery.

Image Notes
1. A tarnished silver tea pot

Image Notes
1. Thats a lot of silver!

Step 17: Zinc

Zinc is naturally dull grey and is very hard to polish. Zinc has has an oxide that flakes off carrying some of the zinc so other things are coated in it so the zinc "rusts" instead of the base metal, this is called galvanization. Because of its low cost zinc is the main metal in us pennies. Zincs melting point is 419°C (786°F). Zinc is nonferrous. Zincs density is 7.14 g/cm3.

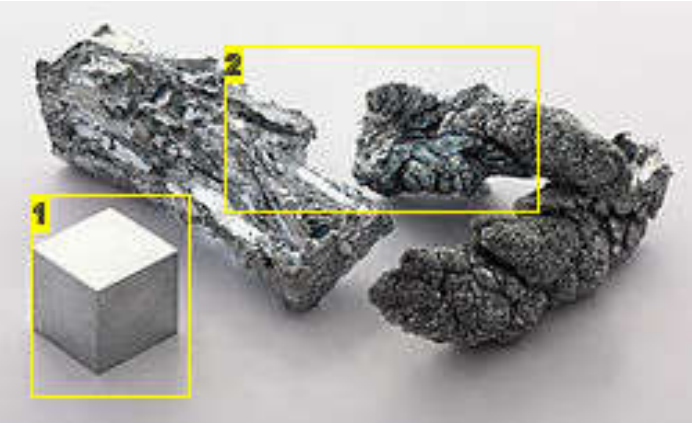

Image Notes
1. unwillingly polished
2. unpolished

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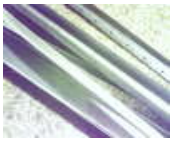

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Comments

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super elephant says: Dec 7, 2010. 5:23 PM **REPLY**

this is not a tuba or a baratone, and for other posters, it is not a trombone, trumpet, or a baratone horn. THIS IS CALLED AN EUPHONEUM (You-phone-E-yuMM). As proof, i play euphoneum, trumpit, trombone, baratone, and tuba! I also have facts here.

This is a tuba, it is extremely large, heavy, and has 4 valves faceing outwords, a short bell, and all adjustment slides are on the inside. the picture posted on this instructable can not be a tuba. (the first picture is a tuba)

this cant be a baratone. It has a long bell pipe, and it doesn't have so many adjustment pipes,has 3 valves, sometimes 4, always pointing out, not up like a trumpits, and onley one tuneing slide. the picture posted on the instructable is not a baratone.(the baratone is the second picture)

this cant be a trombone because a trombone is long thin, has a long slide, and sometimes has one valve, BIG difference.(trombone is picture # 3)

a trumpit is about 1 1/2 feet long(sizes verry slightly), thin, and has three valves pointing up. (trumpit is picture # 4)

a baratone horn is like a trumpit, onley slightly larger than a big trumpit, witn a big bell. (baratone horn is picture # 5)

Finally the euphoneum, the euphoneum is like a baratone, onley with a short wide bell, always 3 valves pointing up, and many tubes inside and out. the picture is an euphoneum (the euphoneum is picture # 6)

nukeme70 says: Jan 9, 2011. 7:36 PM **REPLY**

A tuba might have any of the valve configurations you mention. I have 3 in the house right now - one with 3 upright valves like the original picture, one with the 3 valves facing outward, like in your second picture, and one with 4 rotors, like in your first picture. (I also have 2 marching contrabass bugles with upright valves, like your picture of the marching baritone). A baritone could be thought of as a bass trumpet - they both have cylindrical tubing, whereas a euphonium is more of a tenor tuba - they both have conical tubing, which is also the difference between a trumpet and a cornet. Different manufacturers have different configurations of valves and tubing - some upright, some facing forward, some rotary, some 3 valve, 4 valve - some tubas have up to 6. There are even trumpets that have 4 rotary valves. Your 5th picture is a marching baritone as opposed to a concert horn. A marching euphonium would look similar, but usually has larger diameter tubing and a larger bell.

super elephant says: Jan 22, 2011. 5:32 PM **REPLY**

Alrite, you sound like you know what you are talking about, but that is a euphoneum, it is my current main insterment, and they look exactly the same, except, the one i have is all dented and ugly.
by the way, for all who read about the baratone horn above, that picture isnt a baratone horn. my bad :(. it is a flugel horn.

bricabracwizard says: Mar 15, 2011. 6:14 PM **REPLY**

Just a little correction which is correct by nukeme, 'baritone' not baratone.

thepelton says: Feb 22, 2011. 4:11 PM **REPLY**

One thing I would add. Copper, silver and gold vibrate like a bell when tapped, indeed many bells are bronze. The giveaway that it is gold and not brass is the weight. Gold is about the heaviest non radioactive metal in the periodic table, the only ones heavier are mercury which is liquid, and bismuth, which looks nothing like gold. Gold has a specific gravity just above nineteen, which means its slightly more than nineteen times heavier than water. If you have held a real gold coin, you can't be taken in by a brass substitute.

vidakk says: Feb 24, 2011. 2:00 AM **REPLY**

You are wrong on the subject of densities. While gold does have a density of about 19.3 kg/m^3, both mercury (13.53) and Bizmuth (9.08) are lighter than gold. There are four non-radioactive metals heavier than gold - Rhenium (21.02), Platinum (21.46), Iridium (22.56) and Osmium (22.61).

tranoxx says: Feb 24, 2011. 6:30 AM **REPLY**

But still those four non-radioactive metals still look nothing like gold.

thepelton says: Feb 25, 2011. 3:47 PM **REPLY**

Gold is extremely ductile. The thing that gave it away at the strike at Sutter's Mill was when someone smashed it between two rocks, and it flattened without shattering.

tranoxx says: Feb 22, 2011. 5:32 PM **REPLY**

Thanks this will be a great addition!

Arano says: Nov 21, 2010. 6:59 PM **REPLY**

On some pictures you are saying 'unpolished' when something else would be more accurate as it's the cristaline form of the metal.
If you want i could provide you with a chemical way to identify the metalls. when you do it that way it would improve your accuracy from guessing to nearly sure.

tranoxx says: Nov 21, 2010. 7:53 PM **REPLY**

That would be great if you could tell me! Ill also say that its in crystalline form if they are.

ecanod says: Nov 22, 2010. 2:48 AM **REPLY**

Actually, metals in their common presentation are all crystalline, even though in most cases crystals are not visible to the eye. A chemical treatment can in most cases reveal easily the "grain" (i.e, crystals of the metal). In other cases, crystals can be seen: the "flakes" in the hot galvanized steel are the zinc crystals.
Amorphous (i.e, non-crystaline) metals are usually difficult to prepare and might have different and very interesting properties.

Arano says: Nov 22, 2010. 5:59 PM **REPLY**

hum i wanted to say something slightly different, but as english is not my main language i got it a little wrong...

tranoxx says: Nov 22, 2010. 6:17 PM **REPLY**

... uh what did you want to say differently?

qualia says: Feb 11, 2011. 12:44 AM **REPLY**

i think he was meaning bits like: "Titanium is a silvery grey metal metal when unpolished and darker when unpolished"... so what does it look like polished?
or maybe its something to do with how the actual colouration doesnt change from unpolished to polished, it just has a reduced number of facets over the "smooth" surfaces, so it is reflected a lower number of times. or if the unpolished state you referred to is when it has an oxide film over it which can definitely change the appearance of it's surface.

other than this its a great instructable, just foreigners and such that actually take english seriously might trip up on a few syntax errors.

swgrmn says: Nov 22, 2010. 4:32 AM **REPLY**

Most stainless steels are ferrous, but not magnetic. Ferrous refers to having iron content. (reference the "Fe" symbol in the periodic table). The magnetic properties depend on the crystal structure of the ferrous alloy.

A ferrous alloy(i.e. steel) that forms a BCC (body centered cubic) crystal will be magnetic. Stainless steel that has alloying elements that promote the formation of a FCC (face centered cubic) crystal will NOT be magnetic.

Just wanted to point out this nuance, as everything else in the article was full of good information. Well done!

koebwil says: Nov 22, 2010. 6:43 AM **REPLY**

it's not that most stainless steels are not magnetic, but some aren't. for the most part it depends on the nickel content of the alloy. There are three types of stainless steels, ferritic, austenitic, and martensitic. only austenitic stainless steels are nonmagnetic, but even they can become magnetic again through cold working or work hardening.

tranoxx says: Nov 22, 2010. 1:34 PM **REPLY**

i do not have stainless in the instructabe

koebwil says: Dec 6, 2010. 10:38 PM **REPLY**

It might be a good idea to put stainless steel in the chromium. section it is the main use of chromium.

tranoxx says: Dec 7, 2010. 6:37 AM **REPLY**

i think ill make a different section though

tranoxx says: Dec 7, 2010. 6:33 AM **REPLY**

thats a good idea

tranoxx says: Nov 22, 2010. 6:16 AM **REPLY**

Thanks i will change this in the instructable

zascecs says: Nov 21, 2010. 11:19 AM **REPLY**

That's a tuba, not a trumpet...

Earths_hope says: Dec 1, 2010. 11:14 PM **REPLY**

Tuuuuuuuuubbbbbbbbbbbbaaaaaaaaaaaaa

tranoxx says: Dec 2, 2010. 6:51 AM **REPLY**

indeed

cheif246 says: Nov 25, 2010. 7:26 AM **REPLY**

its a tubaaaaa

tranoxx says: Nov 21, 2010. 2:08 PM **REPLY**
thanks ill change that

zascecs says: Nov 21, 2010. 4:51 PM **REPLY**
no problem

techturtle2 says: Nov 22, 2010. 7:07 AM **REPLY**
actually, it is a baratone (the close cousin of the tuba) but there is little difference other than size and pitch.

zascecs says: Nov 22, 2010. 11:06 AM **REPLY**
ummm... how can you tell it's size with nothing to compare it to in the picture?

techturtle2 says: Nov 23, 2010. 9:52 AM **REPLY**
there is something to compare it to.
i.e. the ring on the second valve-slide, the mouthpeice, and the waterkey.

zascecs says: Nov 23, 2010. 2:53 PM **REPLY**
good point... but what if this is made for midgets? so everything is smaller?

tranoxx says: Nov 25, 2010. 6:10 AM **REPLY**
sorry techturtle2 according to these results, it is a tuba, zasces wins.

http://www.tineye.com/search/1ba0cc438be7291c977317bb304f25835b06c1b0/

zascecs says: Nov 25, 2010. 8:20 AM **REPLY**
:D

REA says: Nov 24, 2010. 7:50 PM **REPLY**
i thought this was chromium...

tranoxx says: Nov 25, 2010. 6:06 AM **REPLY**
yes that is also chromium but not the metal

masterpython says: Nov 23, 2010. 8:20 PM **REPLY**
This guide needs stainless steels and telling austenetic, feritic and martensitic apart. Austenetic is non magnetic. Feritic and martesitic are magnetic but martensitic is much harder and used in knives.

And also distinguishing between cast iron, mild steel, high carbon and alloy steels and wrought iron.

techturtle2 says: Nov 23, 2010. 7:49 PM **REPLY**
LOL

Jack A Lopez says: Nov 21, 2010. 1:06 PM **REPLY**

Step 10 could use some editing.

You used the word "allow" for what I think should be "alloy". Also "there" instead of "they're"

However the major problem is the phrase "us nickels" I am guessing that you are referring to *a particular coin* found in the Former United States. The only reason I was capable of decoding this ambiguous language is because I happen to live in the FUS, and I have seen these coins, and I have verified that a strong magnet will not stick to them. It's the one with a face value of 5/100 FUSD, a "5 cent" piece. The problem is that no one living outside the FUS will have any idea what you're talking about. What does the phrase "us nickels" mean? Does it mean all nickel alloys produced in the Former U.S. actually have copper in them? Does the phrase mean "our nickels", nickels belonging to *us*? *All your nickels are belong to us?* It's totally unclear!

So I humbly suggest editing it to something like "U.S. five cent pieces, commonly called nickels, are not magnetic because they are made from a non-magnetic copper-nickel alloy", or something like that.

Overall, I like this 'ible, but Step 10 is just a spelling/grammar/semantic train wreck. I hope you find this comment helpful.

tranoxx says: Nov 21, 2010. 2:10 PM **REPLY**

ill change this, thanks for telling me

Jack A Lopez says: Nov 23, 2010. 9:16 AM **REPLY**

Glad I could help. BTW, this 'ible is *so metal!!!* Pun intended.
;-)

southbaysue says: Nov 22, 2010. 7:52 PM **REPLY**

hey tranoxx

love this ible AND the comments and suggestions following. it's all a handy compilation...

keep these coming, please! this will be very helpful for me to use for an emergency lesson plan...

sue

tranoxx says: Nov 23, 2010. 6:22 AM **REPLY**

Thank you I will try to keep making guides like this.

$0m3_0n3 says: Nov 22, 2010. 8:46 AM **REPLY**

Hey, does anyone know the melting point of high carbon steel?

bloomautomatic says: Nov 23, 2010. 2:22 AM **REPLY**

Carbon steel melts around 1425-1540C or 2600-2800F. Typically, a higher carbon content lowers the melting point, although other factors could change this.

Source:
http://www.engineeringtoolbox.com/melting-temperature-metals-d_860.html

NutandBolt says: Nov 22, 2010. 10:31 AM **REPLY**

I see you go for the best....carbon steel needs very high tempature to melt. That is 3550°C.

PS118 says: Nov 22, 2010. 10:33 AM **REPLY**

Addition:

How to tell between copper and aluminum... that's pretty easy. But how to tell between iron/steel/carbon steel/stainless?

There are a few different ways, but the about the quickest and most reliable is to grind some and look at the sparks. Wikipedia has a great guide.
http://en.wikipedia.org/wiki/Spark_testing

tranoxx says: Nov 22, 2010. 1:22 PM **REPLY**

I did put some of this in the instructable but the wiki page has only one metal that I included in the instructable, mild steel.

lemonie says: Nov 21, 2010. 12:08 PM **REPLY**

Do you do this, and do you have a camera?

L

tranoxx says:
Do i do what... yes i have a camera
do you want to see my stuff?

Nov 21, 2010. 2:20 PM **REPLY**

view all 58 comments