CORROSIVENESS OF COLA

TEAM OF BELARUS
REPORTER: ARINA KOSTYUSHEVSKAYA

Steps for solution of the task

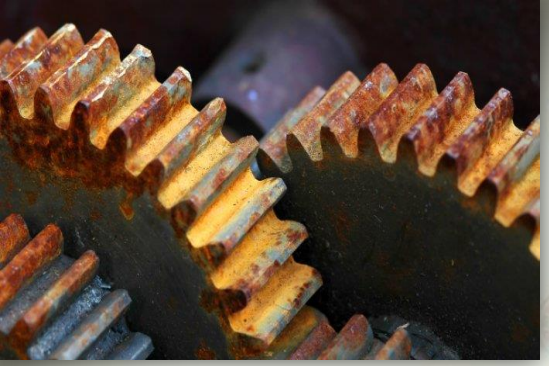
Corrosion as a process

Introduction to cola

Cola VS Corrosion

Biological role of cola

Conclusions



Corrosion

Corrosion is the deterioration of materials by chemical or physical interaction with their environment. The term ‘corrosion’ is sometimes also applied to the degradation of plastics, concrete and wood, but generally refers to metals.

Corrosion according to essence of the process

Chemical:	Electrochemical:
metal reacts with certain substances in air or water.	an interaction between two metals with different electrochemical activity that are separated by electrolyte.

How to fight against corrosion?

Chemical:

to cover surface of the metal with other substance.

Electrochemical:

between details of different metals can be a special cover that becomes corrosed because of interaction with one detail but in the same time this cover protects the other one.

Introduction to cola

- Main components:
  - carbonated water,
  - high fructose corn syrup,
  - caramel color,
  - phosphoric acid,
  - natural flavors,
  - caffeine.

One of the claims about Cola: “You can put a T-bone steak in a bowl of coke and it will be gone in two days.”

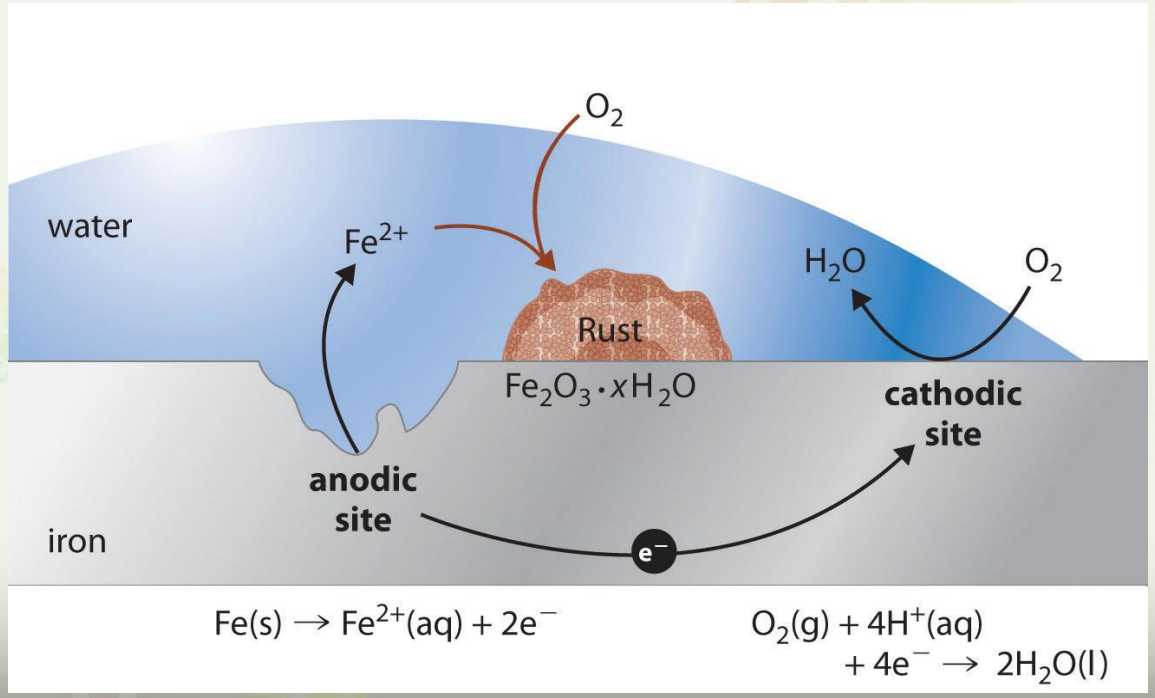
COLA VS CORROSION

1. Can cola help to prevent occurrence of chemical corrosion (e.g. rust)?
2. Can cola fight against chemical corrosion that has appeared already?
3. Can cola be helpful for removing or preventing electrochemical corrosion?

Rust

- An example of chemical corrosion.

- $4Fe + xH_2O + 3O_2 \rightarrow 2Fe_2O_3 \cdot xH_2O$



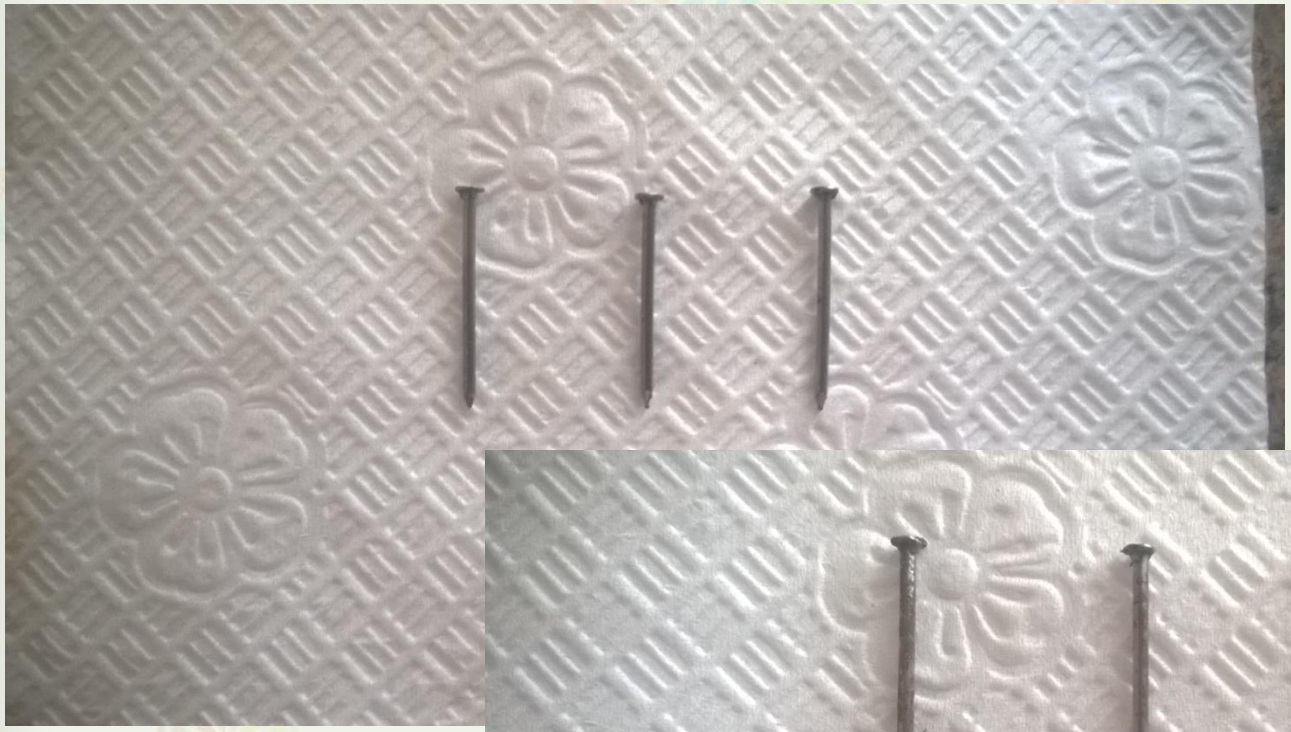
1. Preventing of the occurrence of rust.

- Equipment: 3 glasses of heated water (50 °C), 3 iron nails without rust, oil and cola with the same masses (masses were measured with the help of scales).

- Sequence of operations:

1. to place iron nails into 3 glasses with heated water;
2. to add oil in the 3rd glass and to add cola in the 2nd glass;
3. to wait for a week.

- Results.



SCORE

cola **0:1** corrosion

the 1st round

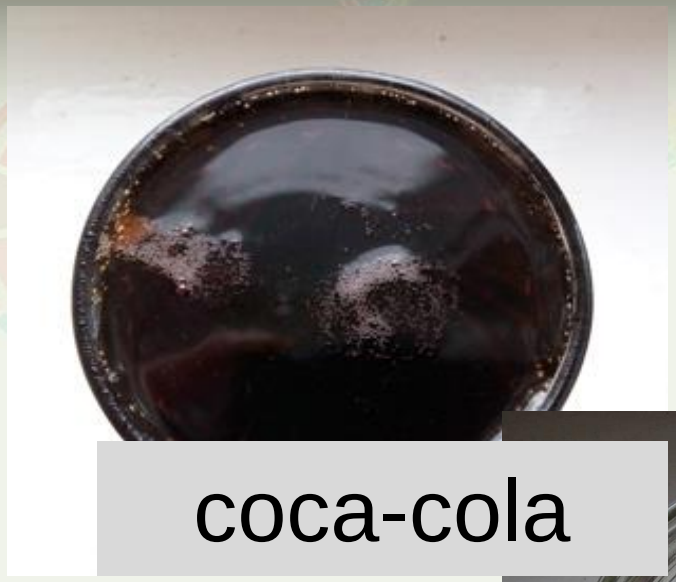
2. Desctruction of rust.

- Equipment: 5 glasses with coca-cola, coca-cola zero, sprite, citric acid (masses of all liquids were equal), 5 nails with equal size and degree of corrosion.

- Sequence of operations: nails were placed into solutions and after certain period of time (1 hour) they were extracted from glasses and fitted on serviette to take a photo.

  Pressure and temperature during the experiment were the same (101, 3 kPa; 25 °C)

apple juice



coca-cola

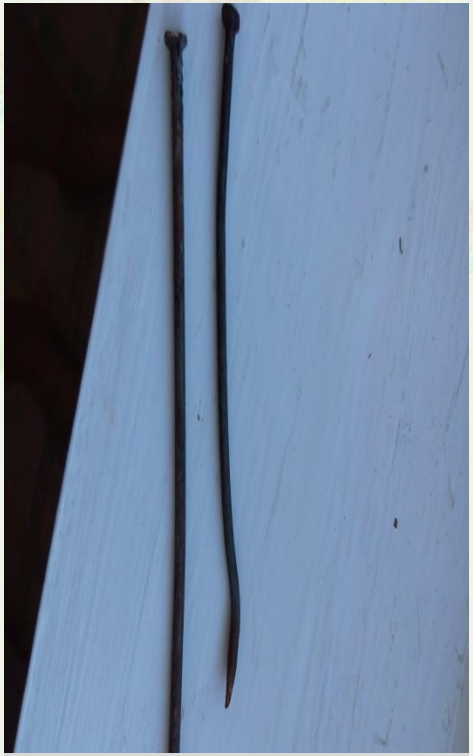
sprite

citric acid

coca-cola zero

- Results.

citric acid



coca-cola and coca-cola zero

apple juice

sprite

SCORE

cola **1:1** corrosion

the 2nd round

How it can be explained?

- Solutions of coca-cola and coca-cola zero, citric acid, apple juice and sprite contain acids. During reaction of neutralization iron hydroxide interacts with acid, so water and salt are created.

$$H_3PO_4 + Fe(OH)_3 \rightarrow Fe_3PO_4 + 3H_2O$$

And what about electrochemical corrosion?

- Cola can't help to avoid or cope with electrochemical corrosion(acids increase electrical conduction of solutions, that's why speed of the process increases too).

SCORE

cola **1:3** corrosion

the 3rd round

Biological role of Cola (influence of the phosphoric acid and sugar).

- Blood sugar levels increase dramatically within 20 minutes of drinking the cola causing a burst of insulin because of high level of sugar in the beverage. The liver then turns the high amounts of sugar circulating our body into fat.
- The phosphoric acid in the beverage dulls the sweetness, enabling us to keep the drink down.

MYTH IS BROKEN

Coca-cola is dangerous for human's body because of the acid.

CORRECT EXPLANATION

Coca-cola is dangerous for human's body because of high level of sugar.

Conclusions

- Coca-cola can be used for removing rust, but it can't be used as a means of preventing of occurrence of rust. This feature of beverage doesn't make it dangerous for our body.
- Coca-cola can't be useful for fight against physicochemical corrosion or for try to avoid it.
- Coca-cola and coca-cola zero have the same influence on removing rust.

THANK YOU FOR ATTENTION!

WHAT HAPPENS ONE HOUR AFTER DRINKING A CAN OF COKE

1 FIRST 10 MINUTES

10 teaspoons of sugar hit your system. (100% of your recommended daily intake.) You don't immediately vomit from the overwhelmingsweetness because phosphoric acid cutsthe flavor allowing you to keep it down.

2 20 MINUTES

Your blood sugar spikes, causing an insulin burst. Your liver responds to this by turning any sugar it can get its hands oninto fat. (There's plenty of that at this particular moment)

3 40 MINUTES

Caffeine absorption is complete. Your pupils dilate, your bloodpressure rises, as a response your liversdumps more sugar into your bloodstream.The adenosine receptors in your brain are now blocked preventing drowsiness.

4 45 MINUTES

Your body ups your dopamine production stimulating the pleasure centers of your brain. This is physically the same way heroin works, by the way.

5 60 MINUTES

The phosphoric acid binds calcium, magnesium and zinc in your lower intestine, providing a further boost in metabolism. This is compounded by high doses of sugar and artificial sweeteners also increasing the urinary excretion of calcium.

6 60 MINUTES

The caffeine's diuretic properties come into play. (It makes you have to pee.) It is now assured that you'll evacuate the bonded calcium, magnesium and zinc that was headed to your bones as well as sodium, electrolyte and water.

7 60 MINUTES

As the rave inside of you dies down you'll start to have a sugar crash. You may become irritable and/or sluggish. You've also now, literally, pissed away all the water that was in the Coke. But not before infusing it with valuable nutrients your body could have used for things like even having the ability to hydrate your system or build strong bones and teeth.