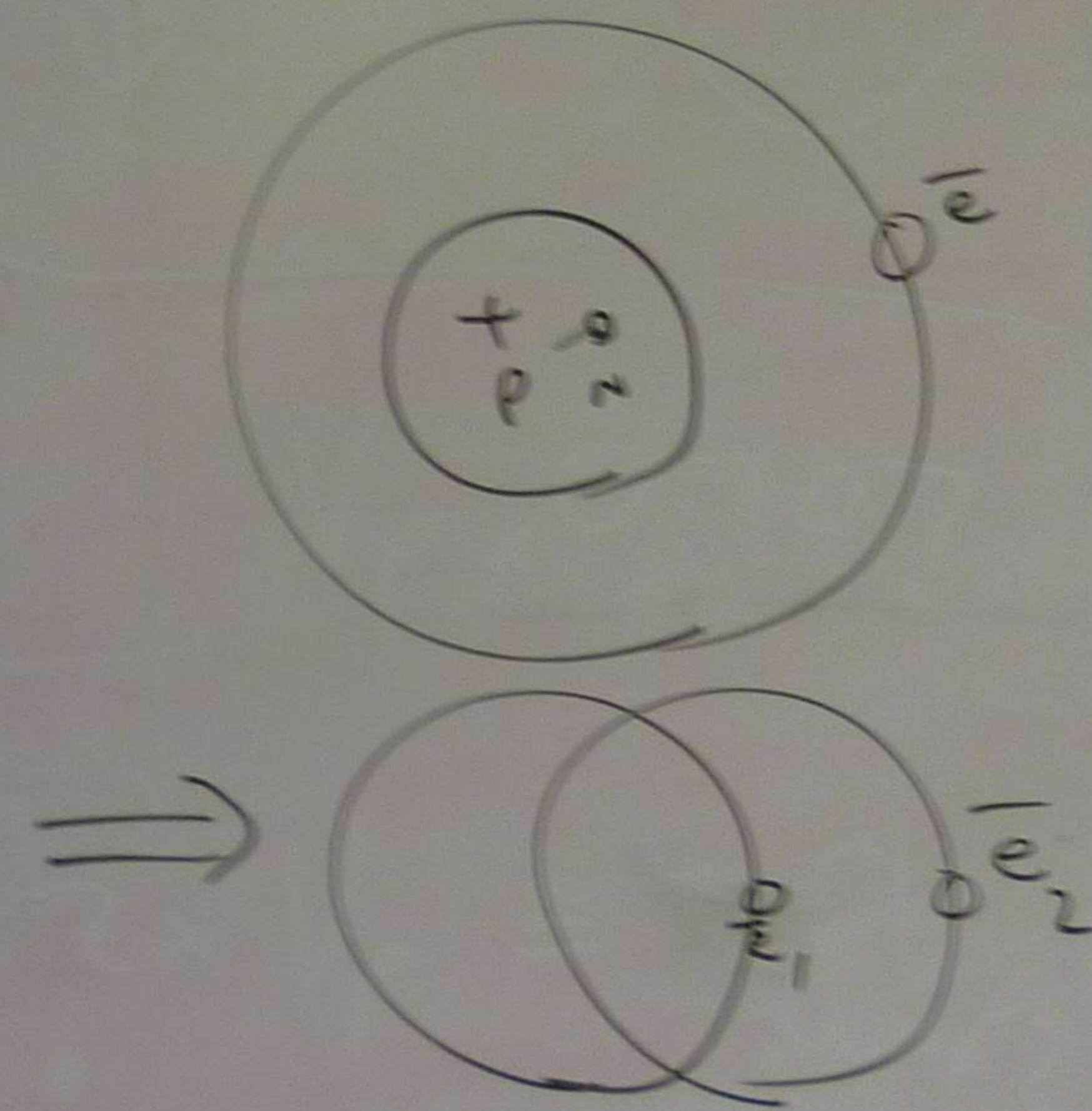


Q22 SKETCH

(a) ELECTRONIC POLARIZATION (b) IONIC POLARIZATION (c) ORIENTAL POLARIZATION

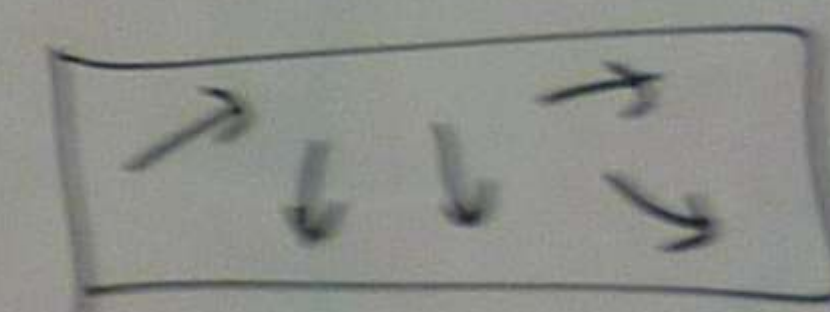
(a)



(b)

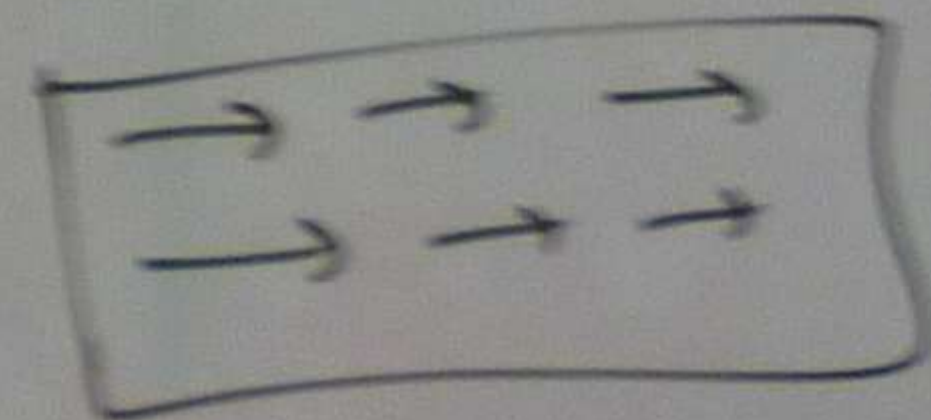


(c)



NO MAGNETIC EFFECT

MAGNETIC FIELD



ORIENTAL POLARIZATION

Q29 DESCR

Q30 DESCR

Q31 DESCR

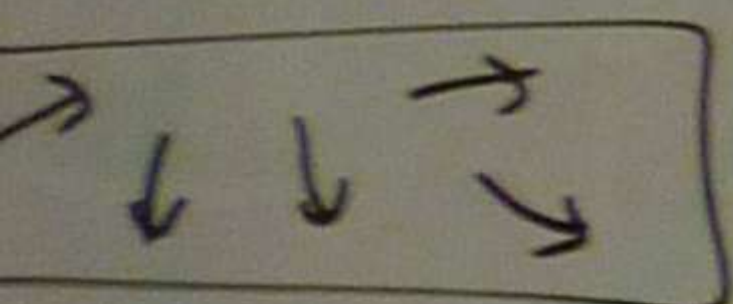
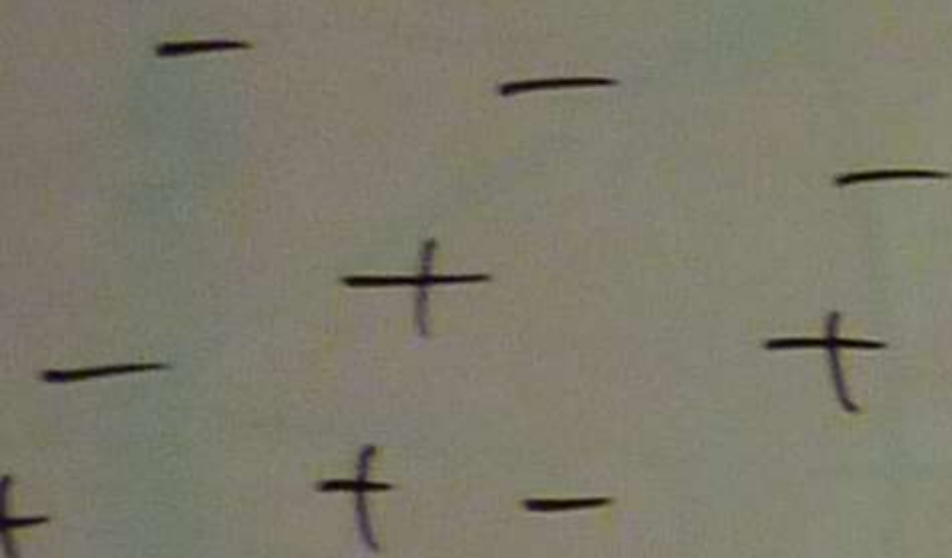
Q29 QUE OF E

Q30 AT

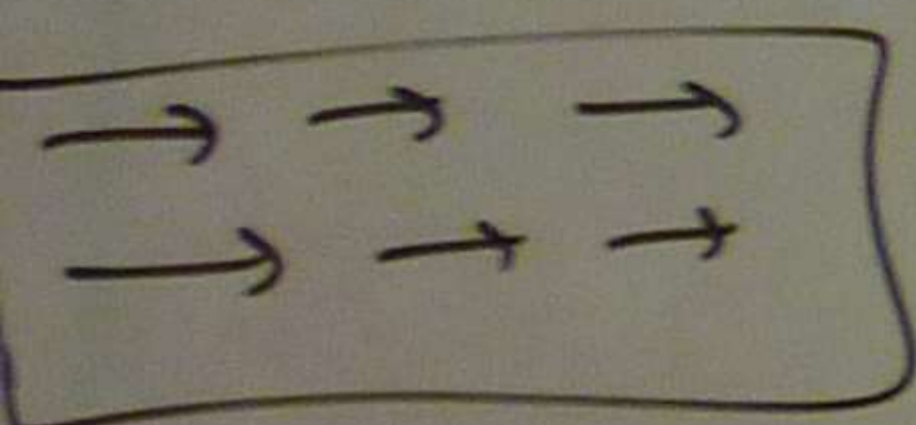
Q31



(c) ORIENTAL POLARIZATION



NO MAGNETIC EFFECT



ORIENTAL POLARIZATION

Q 29 DESCRIBE ELECTRONIC POLARIZATION

Q 30 DESCRIBE IONIC POLARIZATION

Q 31 DESCRIBE ORIENTAL POLARIZATION

Q 29 DUE TO ELECTRIC FIELD, THE ORBIT OF ELECTRON SHIFTS TO NEW ORBIT

Q 30 DUE TO ELECTRON MOVING OUT FROM ATOM, + HOLES AND - ELECTRONS APPEAR IN ATOM

Q 31 DUE TO MAGNETIC FIELD, THE MAGNETIC PARTICLES IN DIFFERENT DIRECTIONS ALIGN TO PARTICULAR DIRECTION AND THE MATERIAL POSSESSES THE MAGNETISM.

Q 24 EXPLAIN ORGANIC

ORGANIC COMPOUNDS

BASIC AND CAN BE

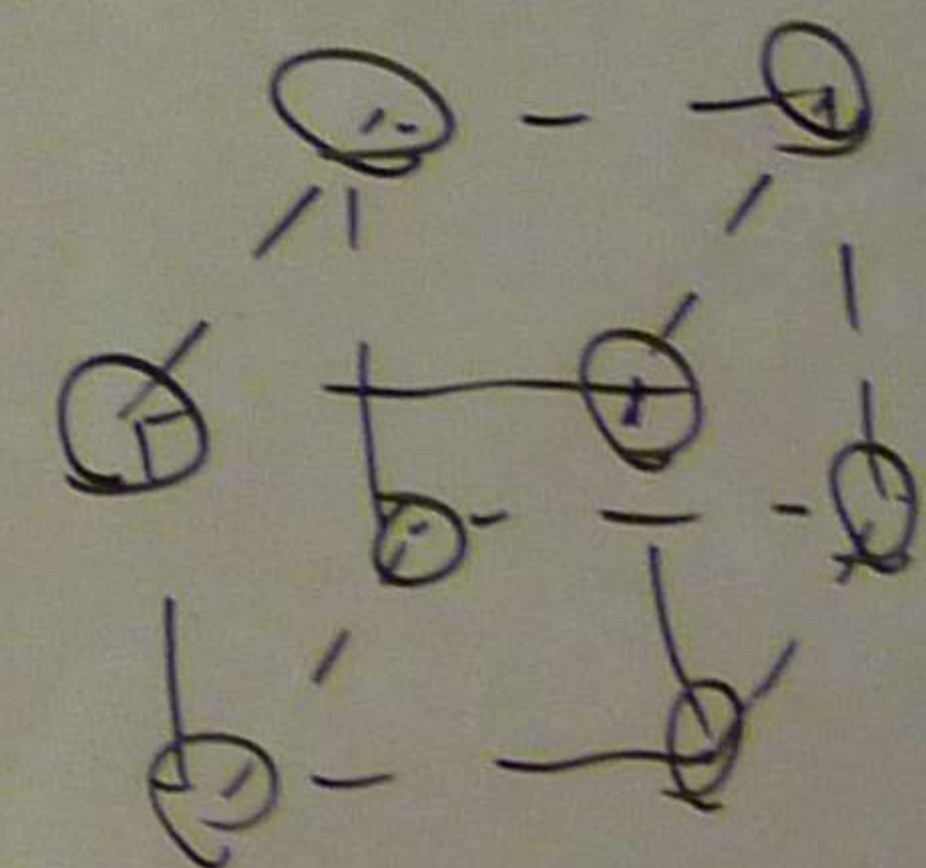
ORGANIC COMPOUNDS

DIELECTRIC MATERIALS.

Q 25 SKETCH THE

(a) SIMPLE CUBIC LATTICE (c)

(a) (b)





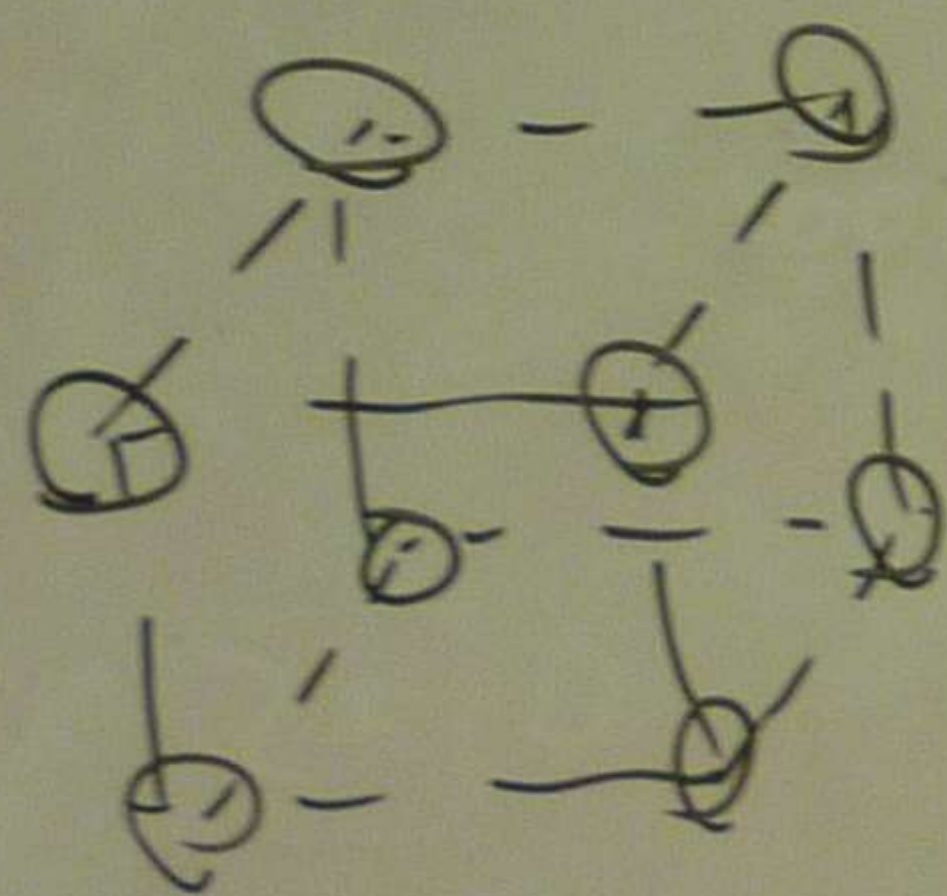
Q24 EXPLAIN ORGANIC COMPOUNDS.

ORGANIC COMPOUNDS CONSIST OF CARBON AND HYDROGEN AS BASIC AND CAN BE COMPOUNDED WITH FLUORINE E.T.C. ORGANIC COMPOUNDS ARE APPLIED TO MAKE INSULATION AND DIELECTRIC MATERIALS.

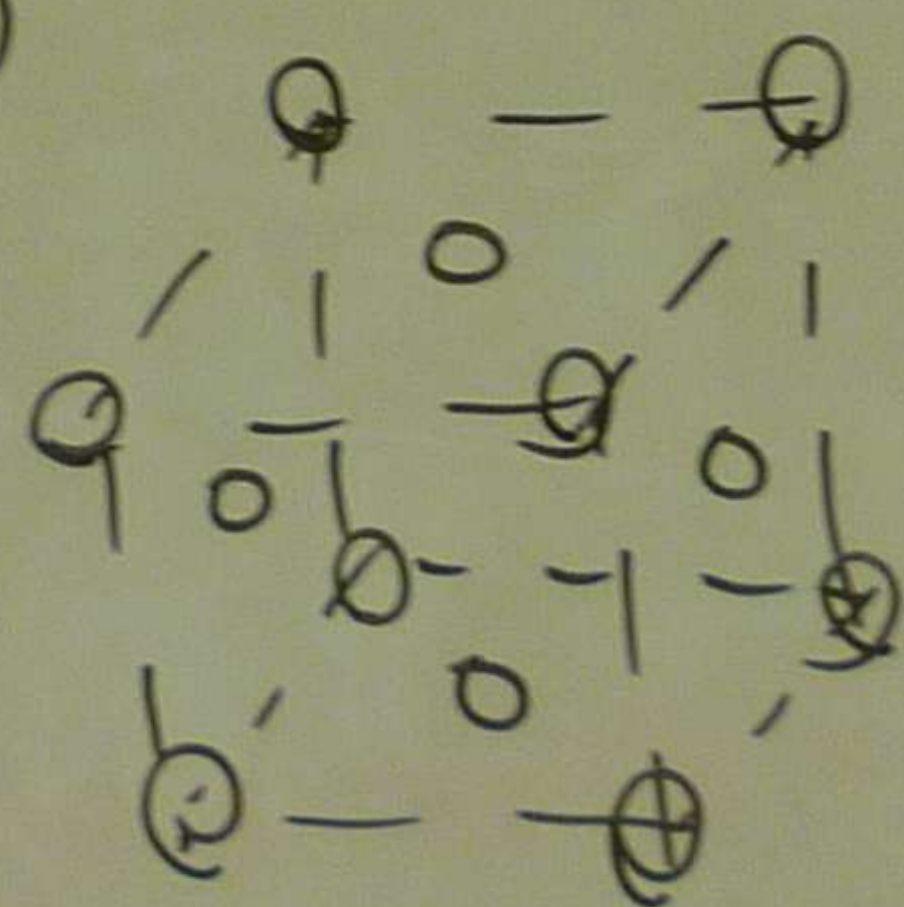
Q25 SKETCH THE FOLLOWINGS

(a) SIMPLE CUBIC LATTICE (b) FACE CENTRED CUBIC LATTICE (c) BODY CENTRED CUBIC LATTICE.

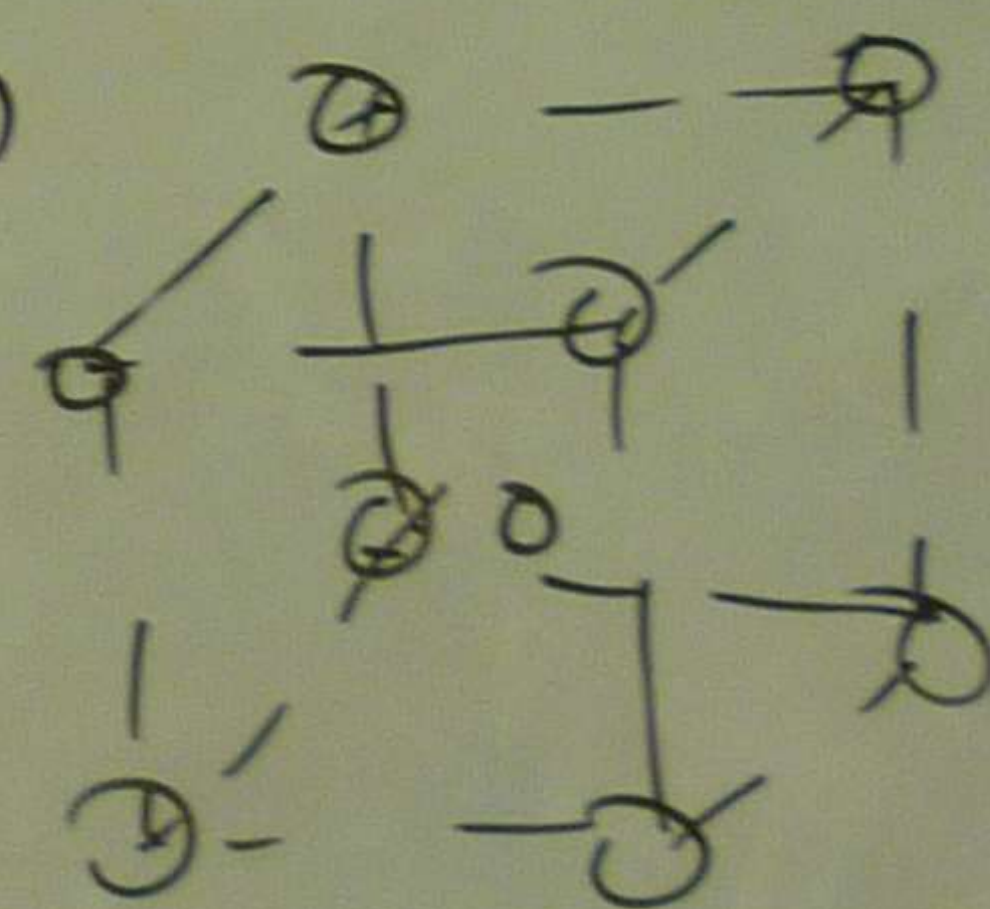
(a)



(b)



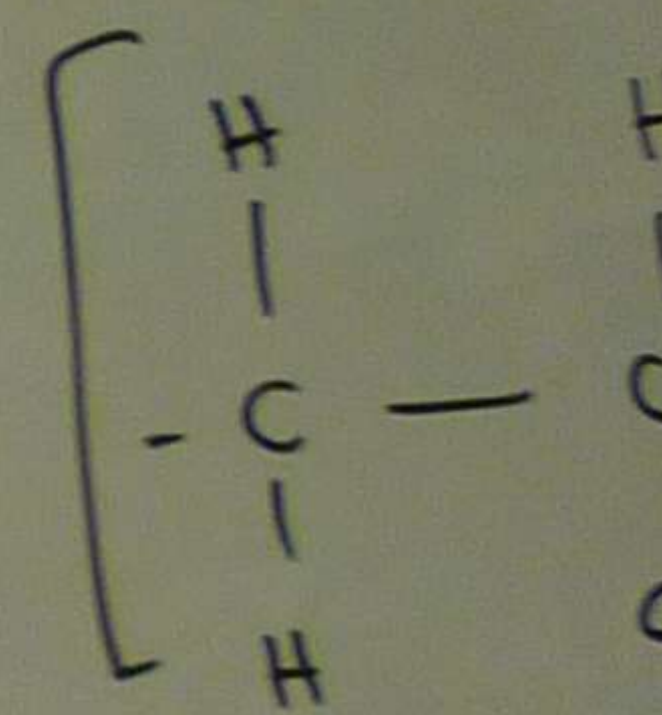
(c)



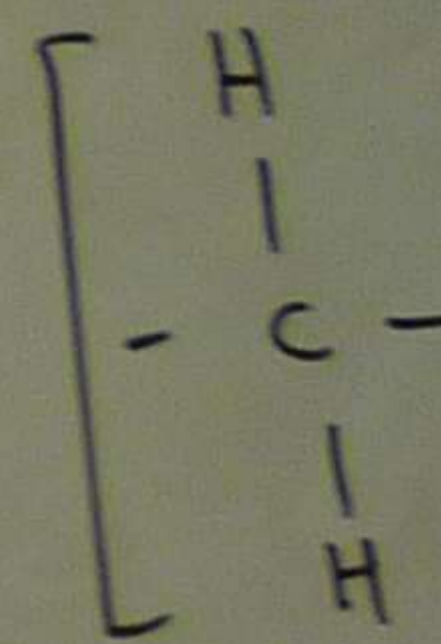
Q26 EXPRESS OF

(a) POLY VINYL

(a) POLY VINYL



(b)



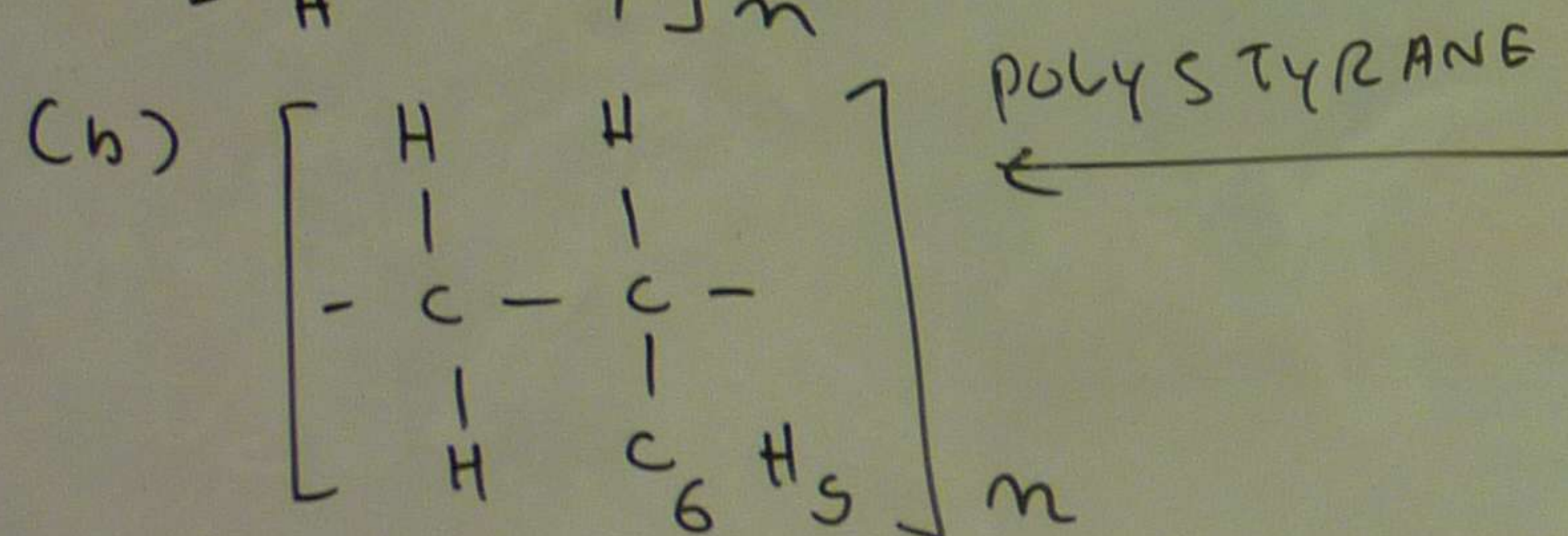
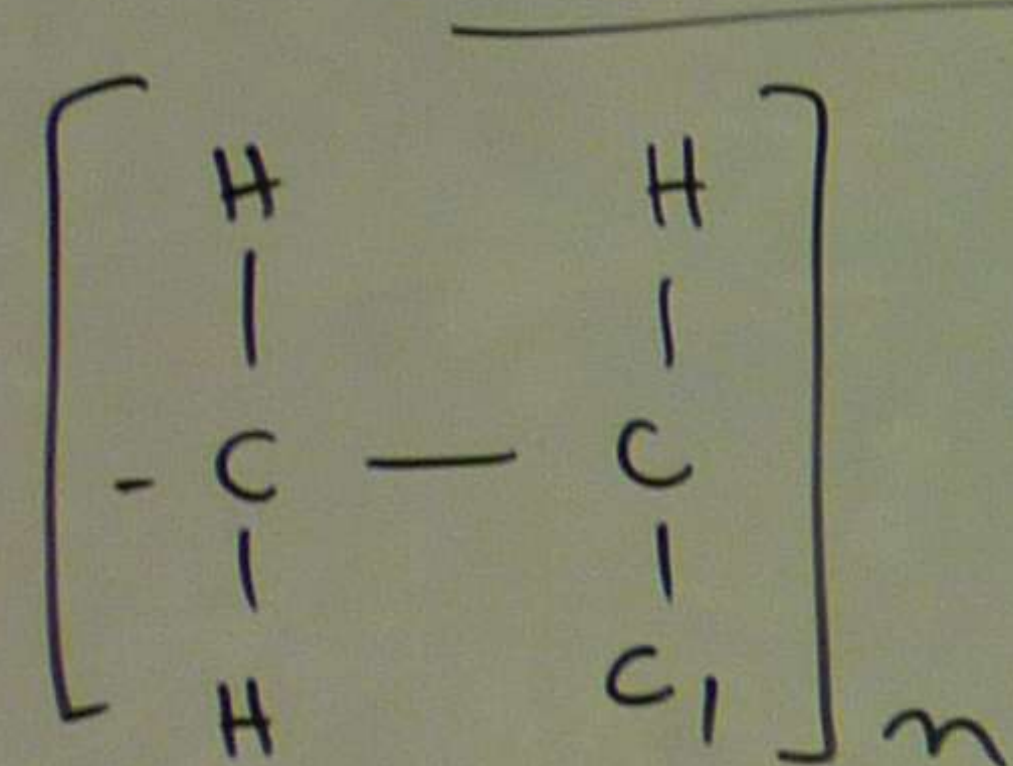


Q26

EXPRESS THE CHEMICAL STRUCTURE  
OF

(a) POLY VINYL CHLORIDE (b) POLYSTYRENE

(a) POLY VINYL CHLORIDE



## REFERENCE NOTES

WWW.electrical diploma 2013. zoomshare.com

EOB/ MATERIAL SCIENCE

✓ T6 NON METALLIC MATERIALS (PPT)

✓ T3 CONDUCTORS & SEMI CONDUCTOR

✓ T4 CHEMICAL EFFECT ON MATERIALS

↳ CORROSION PROTECTION

T7 MANUFACTURING PROCESS & MATERIALS

TEXT BOOK

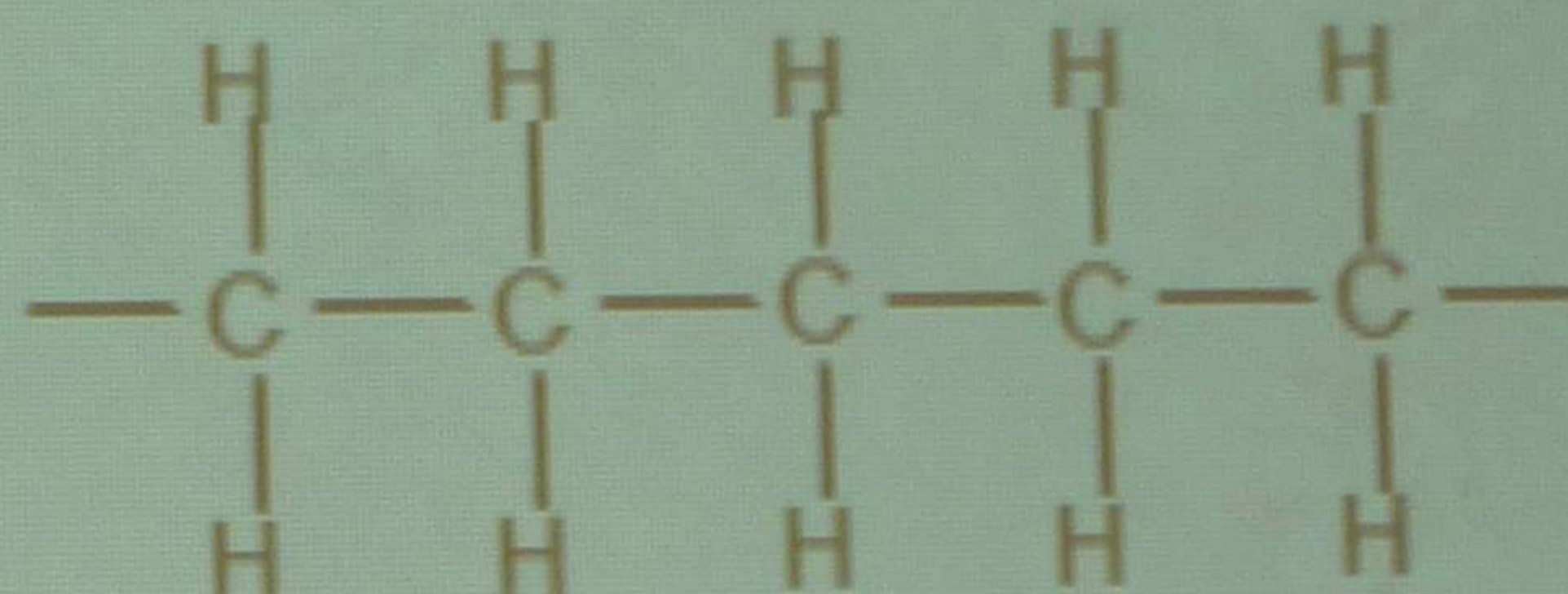
PAGE 7 → 13



## Properties of polymers

## Chemical Composition

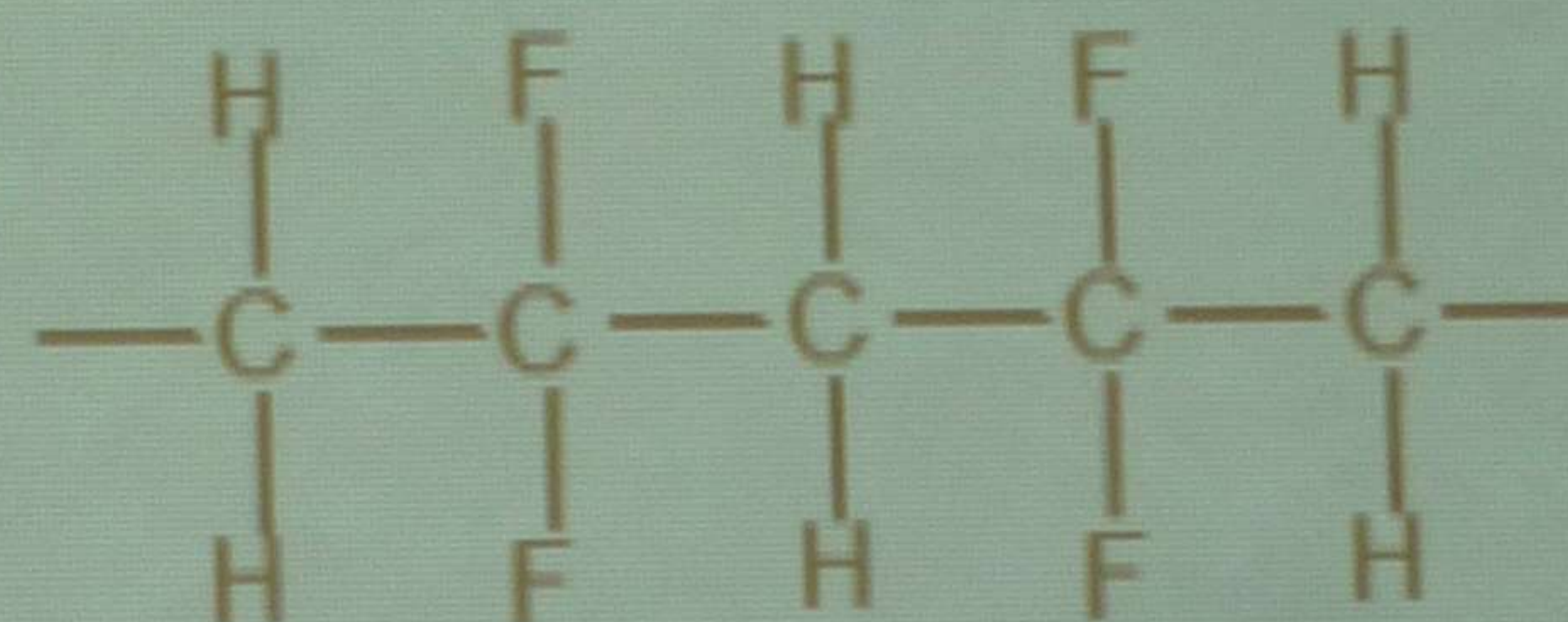
soft to hard, unbreakable,  
(MWTM)



Polyethylen (PE)

weich bis hart,  
unzerbrechlich,  
löslich in einer Vielzahl  
von Lösungsmitteln  
(MWTM)

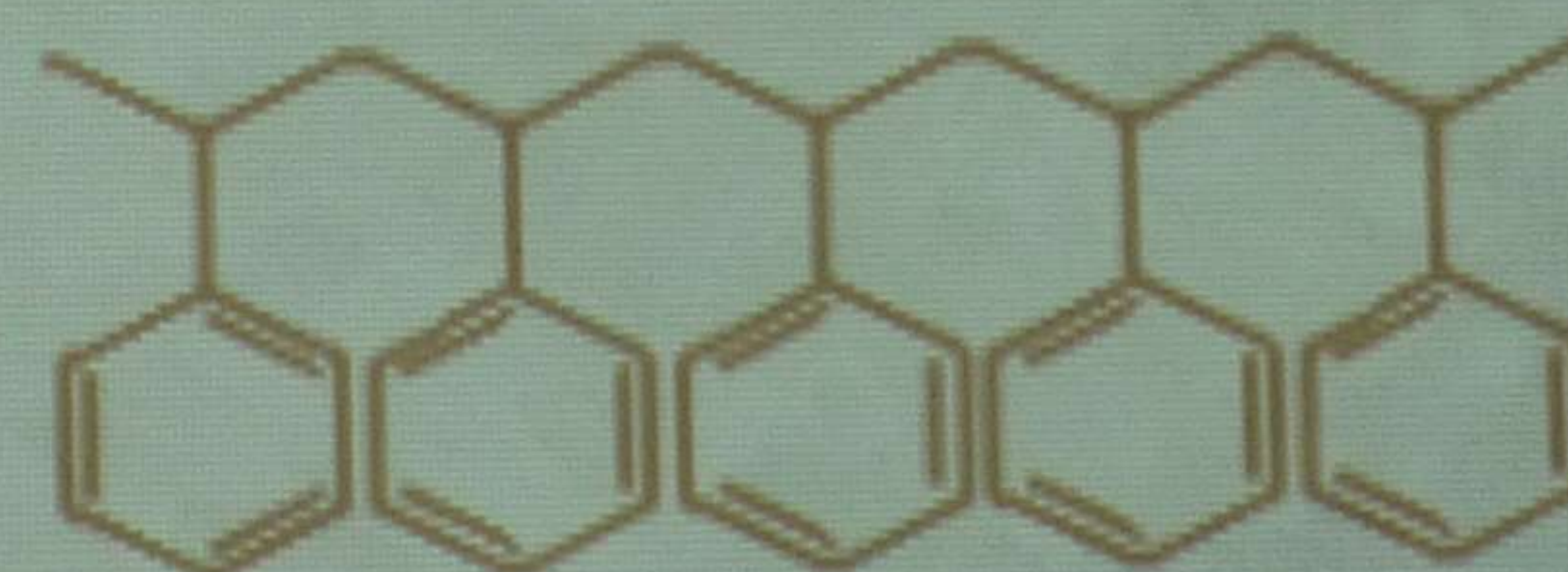
hard, tough, unbreakable,  
superior chemical resistivity  
(OBTF)



Polyvinylidenfluorid (PVDF)

hart, zäh,  
unzerbrechlich,  
hervorragende chem.  
Beständigkeit  
(OBTF)

hard, breakable,  
(plastic spoons and forks,  
joghurtbeaker)

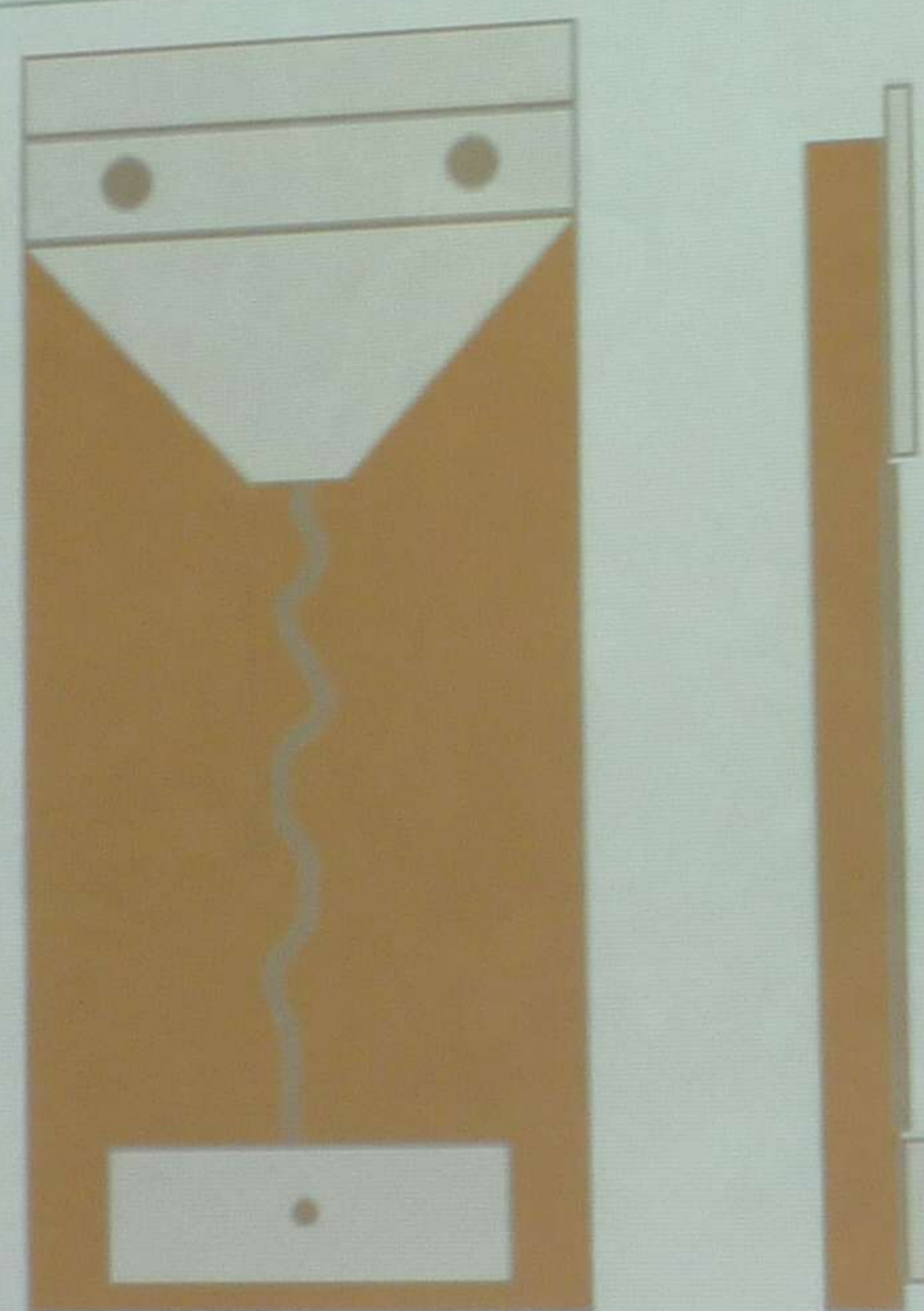


Polystyrol (PS)

hart,  
zerbrechlich  
(z.B. Geodreiecke,  
Joghurtbecher,  
Wegwerfbestecke)

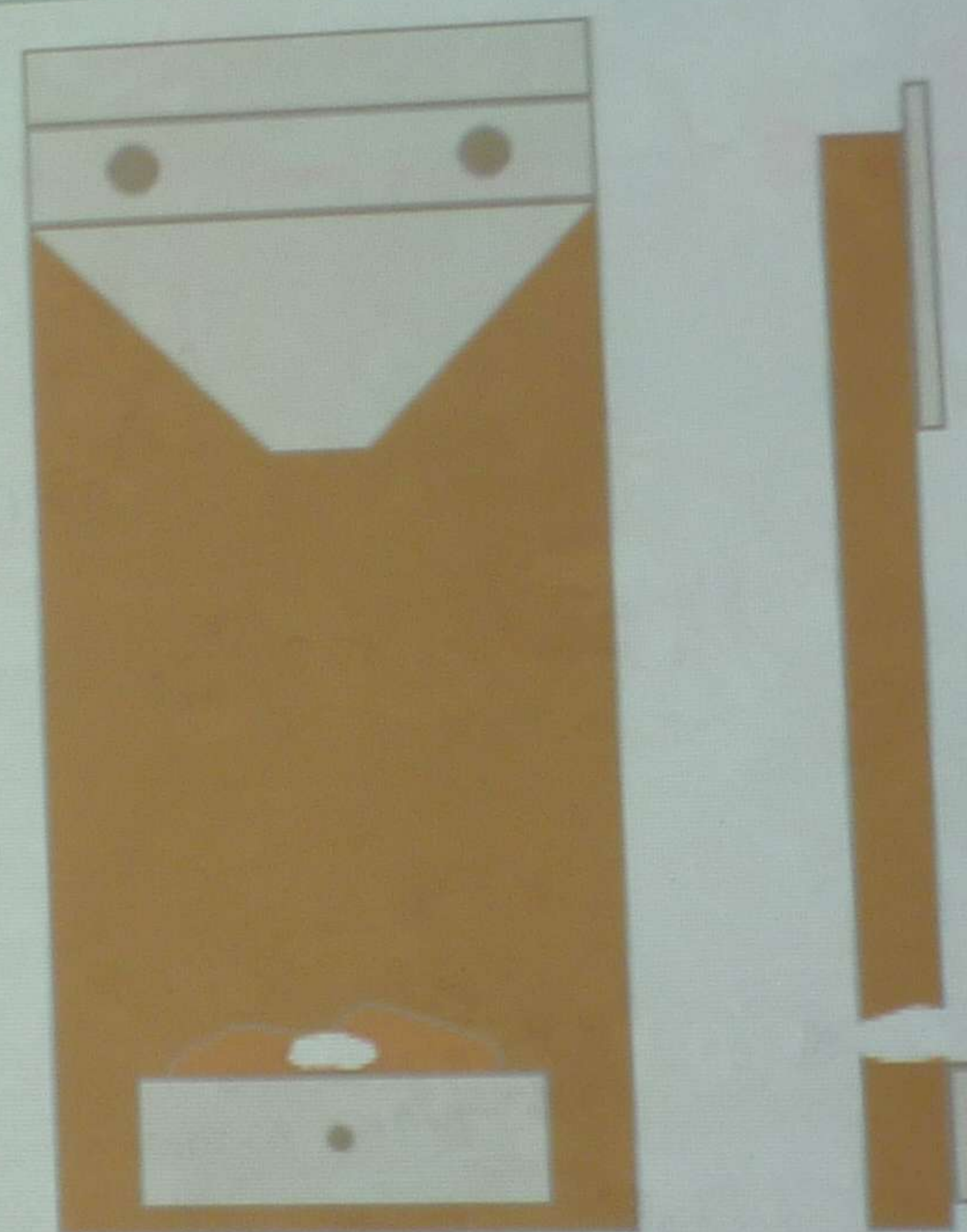


## TERT - Key Failure Mechanisms



Sample - Front View Side View

Tracking failure  
(rapid process)



Sample - Front View Side View

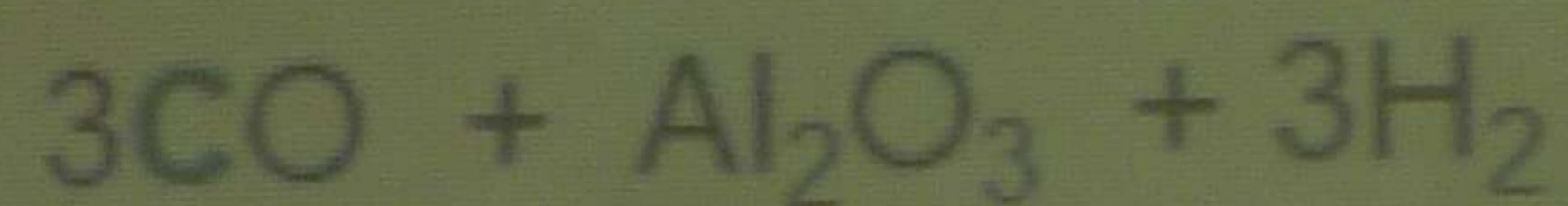
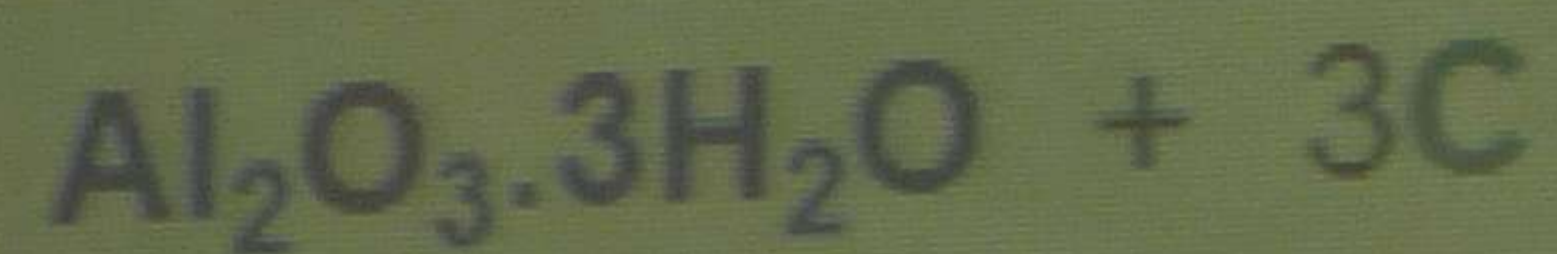
Erosion failure  
(slow process)

$C_2H_4$   
 $C_3H_4$   
 $C_3F_4$

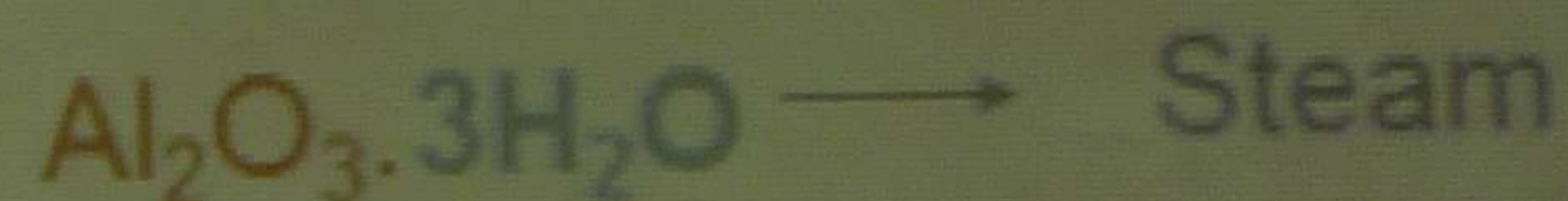
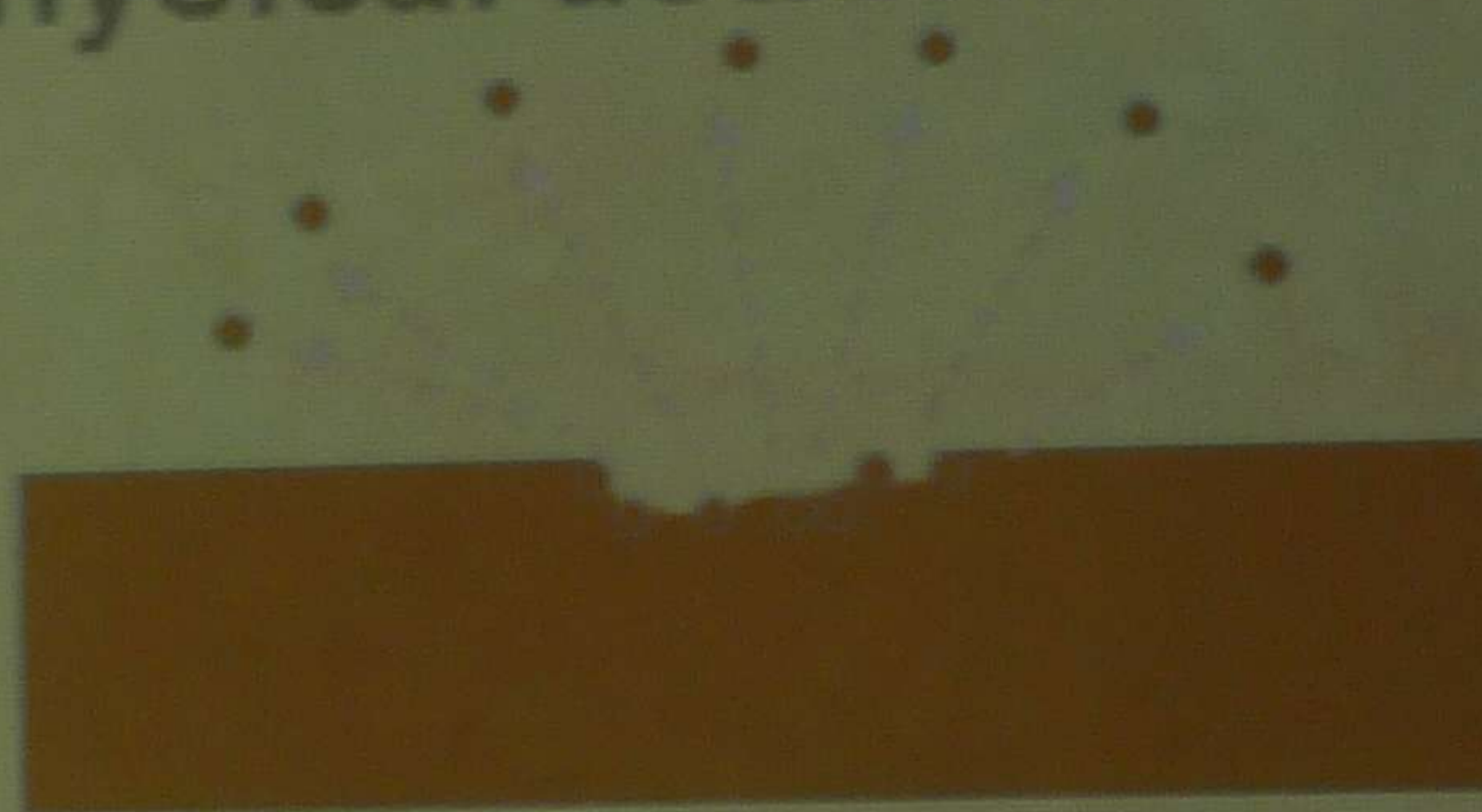


## Anti-Tracking Properties Through Aluminium Tri Hydrate

### 1. Chemical action:

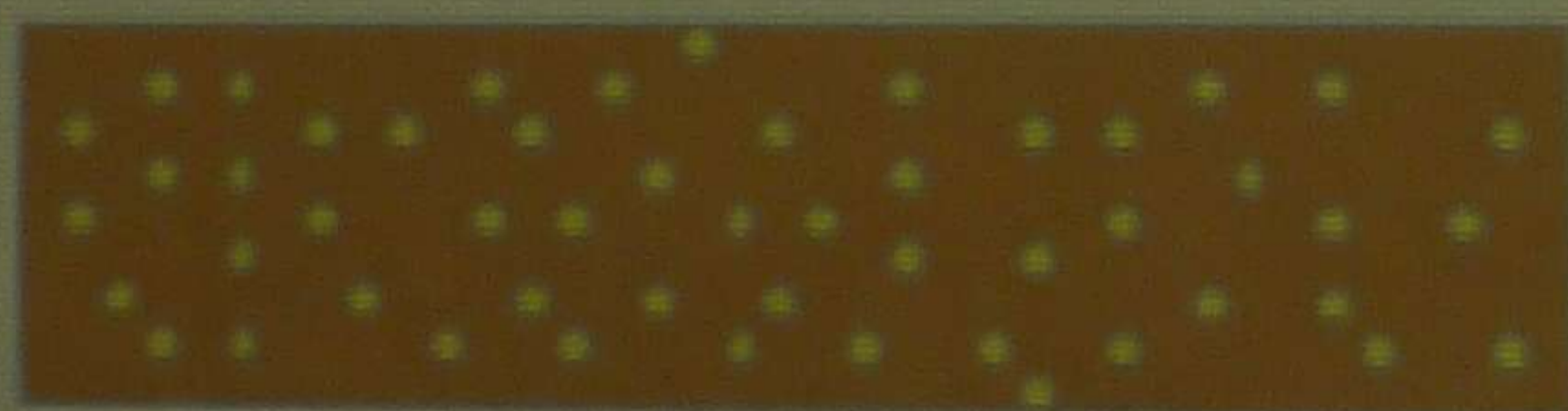


### 2. Physical action:



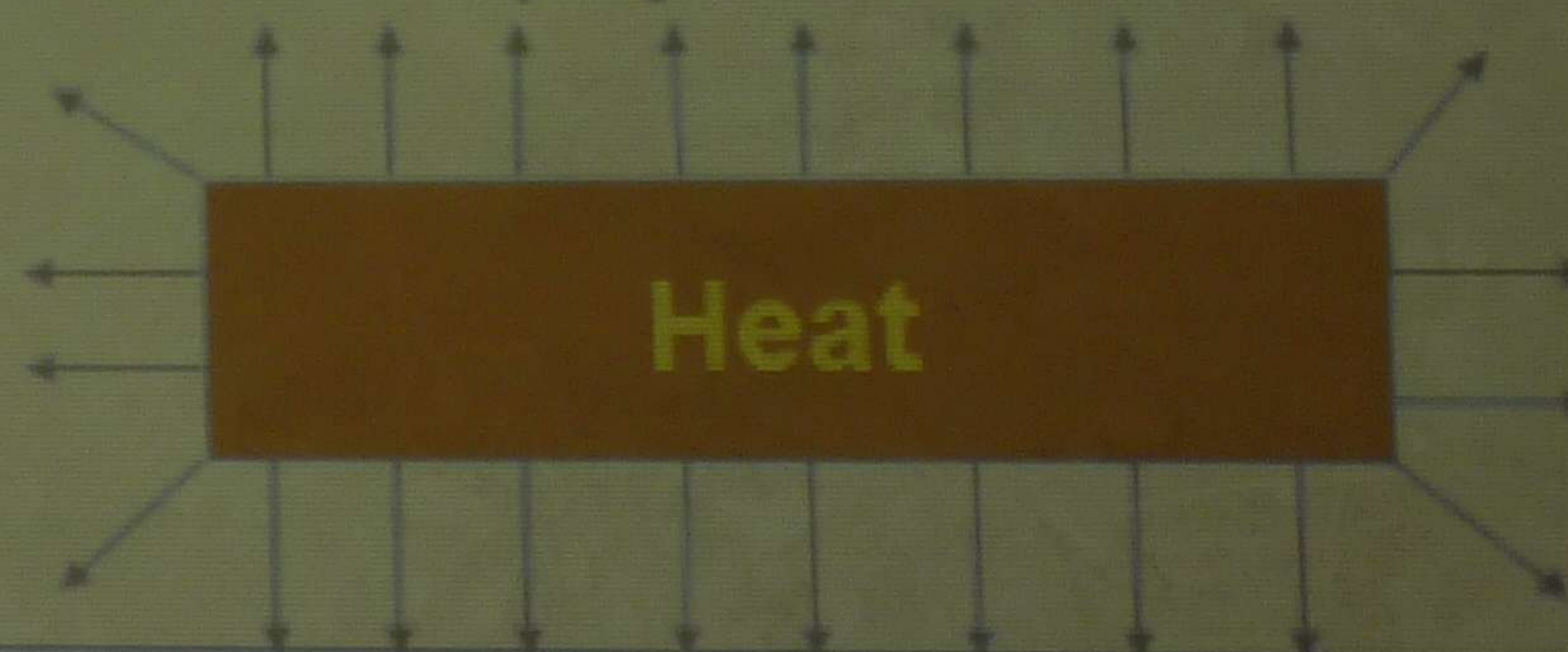
### 3. Volume effect

The amount of fuel (polymer) is reduced by adding ALTH



### 4. Thermal effect

Endothermic reaction keeps polymer cool

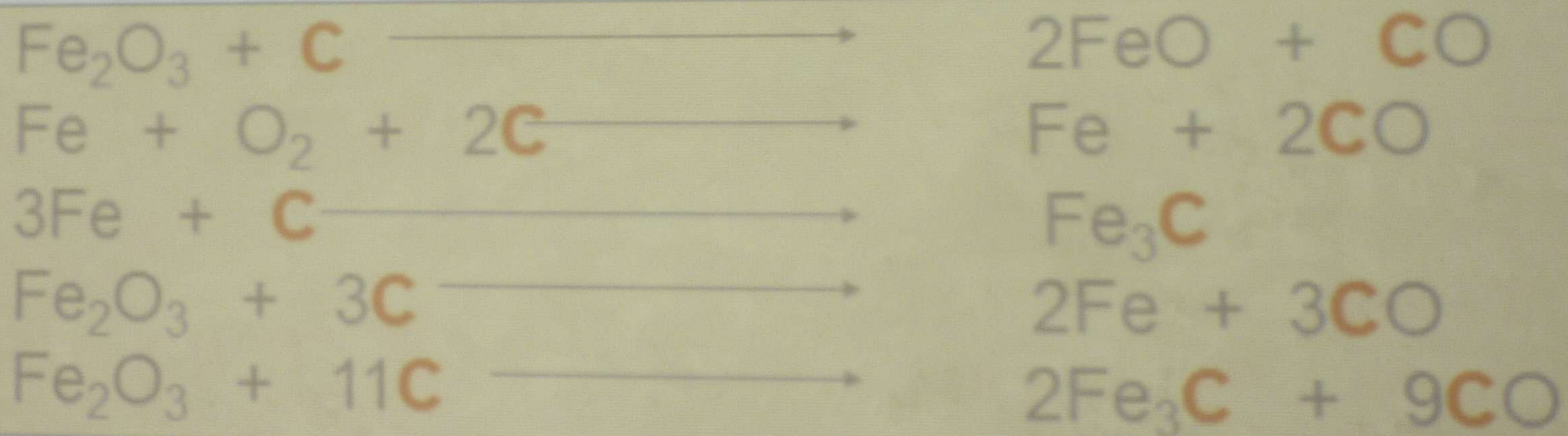




## Mechanism Of Iron Oxide

Iron oxide acts as a UV screen and an additional catalyst for oxidation of the char (anti-tracking properties) in silicone materials

Examples of reaction;





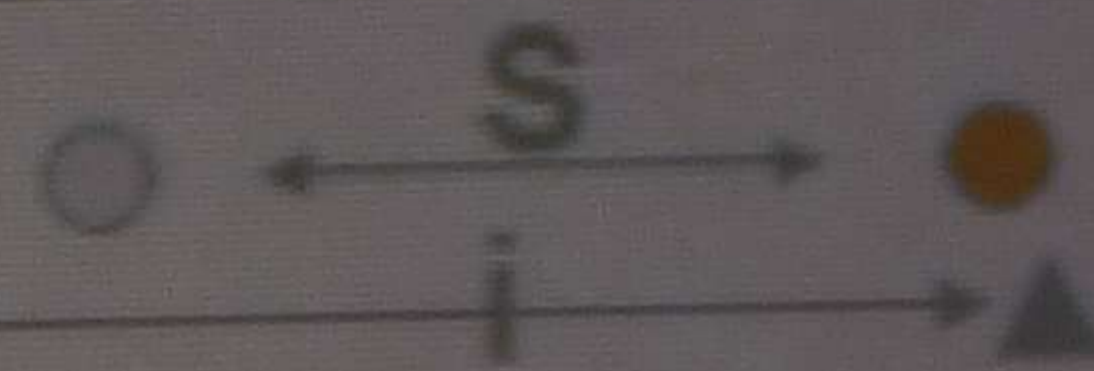
## Material Comparison



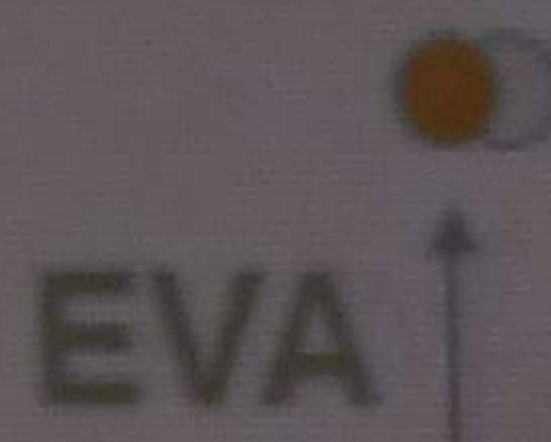
Hydrophobicity

Competitive anti-tracking silicones tend to exhibit poor physical properties due high filler levels

Competitive anti-tracking EPDM's tend to exhibit poor physical properties due high filler levels



Raychem anti-tracking silicones exhibit good physical properties due to proprietary fillers used at low loadings



Anti-tracking performance

- Raychem materials
- ▲ Competitive Silicones
- Competitive EPDM's



## Base Polymer Tracking Resistance

---

In general conduction (tracking) is facilitated by a combination of the following factors :

- Chain formation
- Aromaticity
- Conjugation
- Ionic Charge Centers
- Interaction Of Adjacent Charged Zones



Q26

EXPLAIN COVALENT BONDING

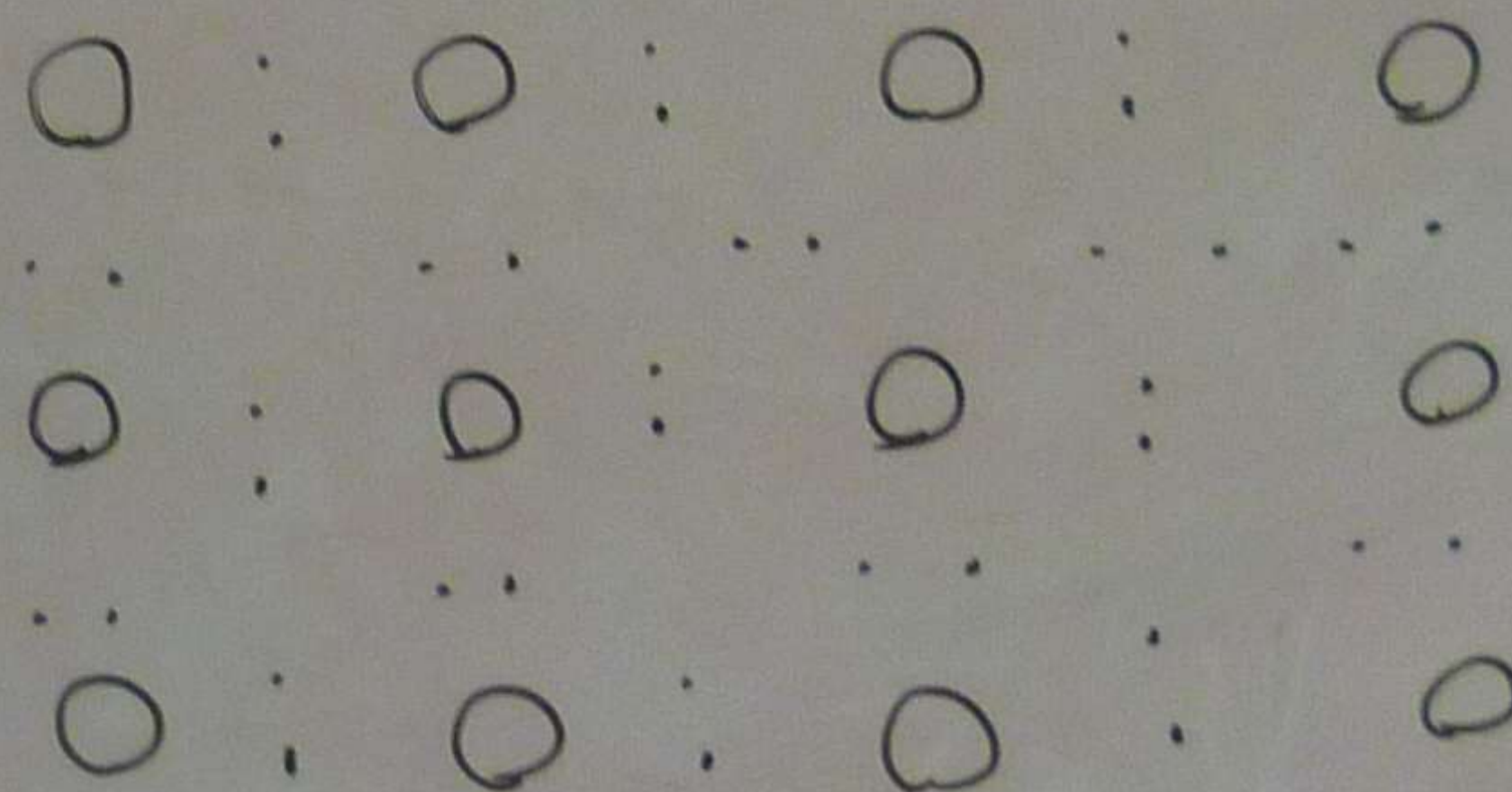
Q27

EXPLAIN ATOMIC STRUCTURE OF METAL

Q28

WHAT IS CRYSTAL?

Q26



THE REPULSIVE FORCE DUE TO  
OVERLAP OF ELECTRON SHELL  
FINALLY OVERCOMES ATTRACTIVE  
FORCE AND THE CRYSTAL FORMS  
WITH AN ATOMIC SPACING

CORRESPONDING TO MINIMUM ENERGY

THE ENERGY CURVES ARE SIMILAR  
FOR IONIC CRYSTAL.

CARBON, GERMANIUM AND  
COVALENT CRYSTALS.

Q27

IN METAL, THE VALENCE  
ELECTRONS ARE SHARED BY ALL ATOMS  
HIGHLY MOBILE, THAT IS  
EASILY IN THE CRYSTAL.

A METAL MAY BE CONSIDERED  
AN ASSEMBLY OF POSITIVELY CHARGED IONS  
IN THE SEA OF NEGATIVELY CHARGED ELECTRONS.  
THE ATTRACTIVE FORCES  
TOGETHER ARE MAINTAINED  
FORCE BETWEEN THEM.



BONDING

STRUCTURE OF METAL

CRYSTAL?



repulsive force due to  
repulsion of electron shell  
which overcomes attractive  
force and the crystal forms  
an atomic spacing

CORRESPONDING TO MINIMUM ENERGY FOR CRYSTAL

THE ENERGY CURVES ARE SIMILAR TO THOSE SHOWN  
FOR IONIC CRYSTAL.

CARBON, GERMANIUM AND SILICON ARE IMPORTANT  
COVALENT CRYSTALS.

Q27 IN METAL, THE VALANCE (OUTER MOST) ELECTRONS  
ARE SHARED BY ALL ATOMS, THIS TAKES THEM  
HIGHLY MOBILE, THAT IS THEY CAN MOVE ABOUT  
EASILY IN THE CRYSTAL.

A METAL MAY BE CONSIDERED TO CONSIST OF  
AN ASSEMBLY OF POSITIVE IONS EMBEDDED  
IN THE SEA OF NEGATIVE ELECTRONS.

THE ATTRACTIVE FORCE WHICH KEEP THE ATOMS  
TOGETHER ARE MAINLY COULOMBIC ATTRACTIVE  
FORCE BETWEEN THE SYSTEM OF POSITIVE

IONS AND NEGATIVE CHARGES  
DISTRIBUTION CORRESPONDING  
TO VALANCE ELECTRONS.

COPPER, SILVER, GOLD  
NICKELS ARE THIS TYPE OF  
CRYSTALS

Q28 THE CRYSTAL  
IS BASED ON THE  
TWO POINTS

(a) THE UNIT CELL  
IS THE SMALLEST  
OF CRYSTAL LATTICE  
OUT OF WHICH THE  
CRYSTAL MAY BE  
FORMED BY REPEATING  
UNIT CELL



IONS AND NEGATIVE CHARGE DISTRIBUTION CORRESPONDING TO VALANCE ELECTRONS.

COPPER, SILVER, GOLD, ALUMINIUM NICKELS ARE THIS TYPE OF CRYSTALS

Q 28 THE CRYSTAL STRUCTURE IS BASED ON THE FOLLOWING TWO POINTS

(a) THE UNIT SHELL WHICH IS THE SMALLEST ELEMENT OF CRYSTAL LATTICE OUT OF WHICH THE ENTIRE CRYSTAL MAY BE FORMED BY REPEATITION OF THE UNIT CELLS.

(b) THE LATTICE CONSTANT WHICH IS THE LENGTH OF THE UNIT CELL ALONG ONE OF IT'S EDGES.

### CHEMICAL EFFECT ON MATERIALS

CHEMICAL IMPACTS  $\longrightarrow$  MATERIAL CORROSION

NON METALLIC MATERIALS SLIDE 68  $\longrightarrow$  73

Q 49 EXPLAIN CHEMICAL REACTION INSIDE ELECTRIC CELL.

Q 50 EXPLAIN CORROSION

Q 51 DESCRIBE THE FOLLOWINGS  
(a) GALVANIC CORROSION (b) CORROSION REMOVAL  
(c) RESISTANCE

Q 52 WRITE THE WAYS TO PROTECT CORROSION.

Q 53 WHAT ARE THE FORMS OF CORROSION.

Q 49



SPE

OCU

RESU

OF

THI

NOR

Q 50

D

U

ATOMS

CTIVE

E



THE LENGTH  
IT'S EDGES.

MATERIALS

IAL CORROSION

DE 68 → 73

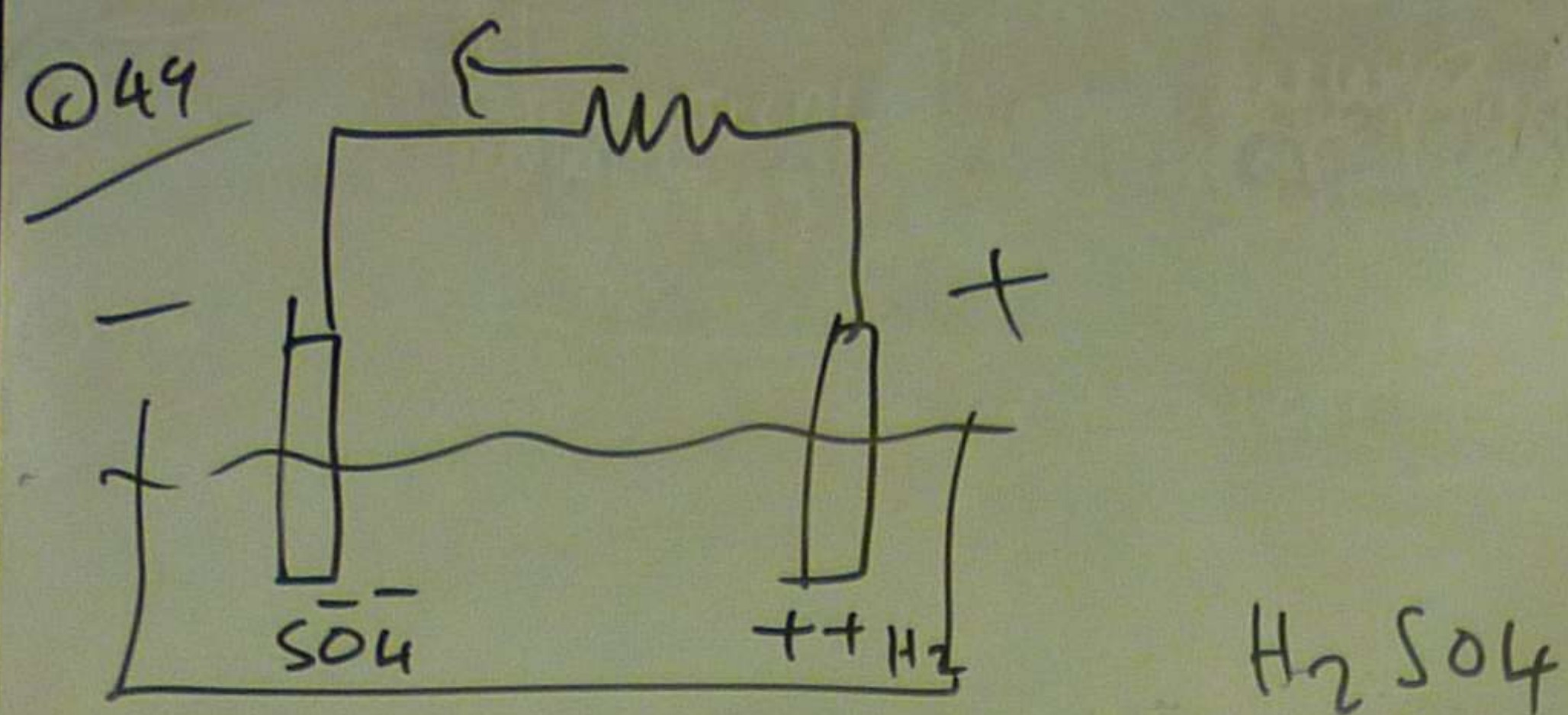
ON INSIDE ELECTRIC CELL.

ES

ON (6) CORROSION REMOVAL

PROTECT CORROSION.

of CORROSION.



SPECIAL CHEMICAL REACTION WHICH  
OCCUR INSIDE THE ELECTRIC CELL  
RESULT IN OXIDATION AND REDUCTION  
OF THE SUBSTANCES INSIDE THE CELL  
THIS PRODUCES ELECTRICAL ENERGY.  
NORMAL BATTERIES WORK LIKE THIS

Q50 CORROSION IS THE GRADUAL  
DESTRUCTION OF MATERIALS  
USUALLY METALS BY CHEMICAL  
REACTION WITH IT'S ENVIRONMENT.

THIS MEANS ELECTRO-CHEMICAL OXIDATION  
OF METALS IN REACTION WITH  
OXIDANT SUCH AS OXYGEN. RUSTING,

FORMATION OF IRON OXIDE IS A WELL KNOWN EXAMPLE OF OXIDATION.

## REFERENCE NOTES

www.electrical diploma 20

EOB/ MATERIAL SCIENCE

✓ T6 NON METALLIC MATERIALS

✓ T3 CONDUCTORS & SEMI CONDUCTORS

✓ T4 CHEMICAL EFFECT ON MATERIALS

T7 MANUFACTURING PROCESS

TEXT

PAGE 2



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protection  
materials



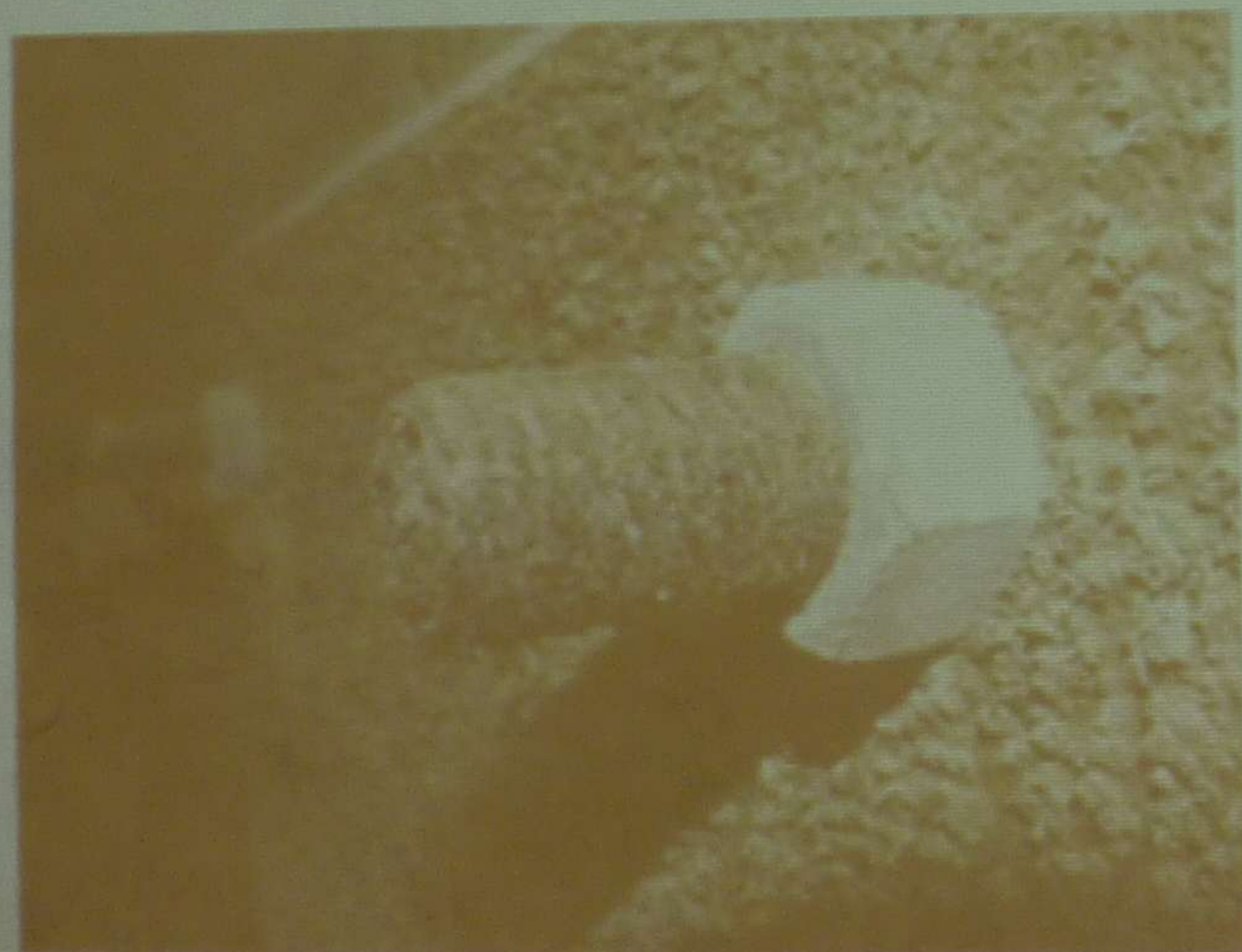
Rust, the most familiar example of corrosion.



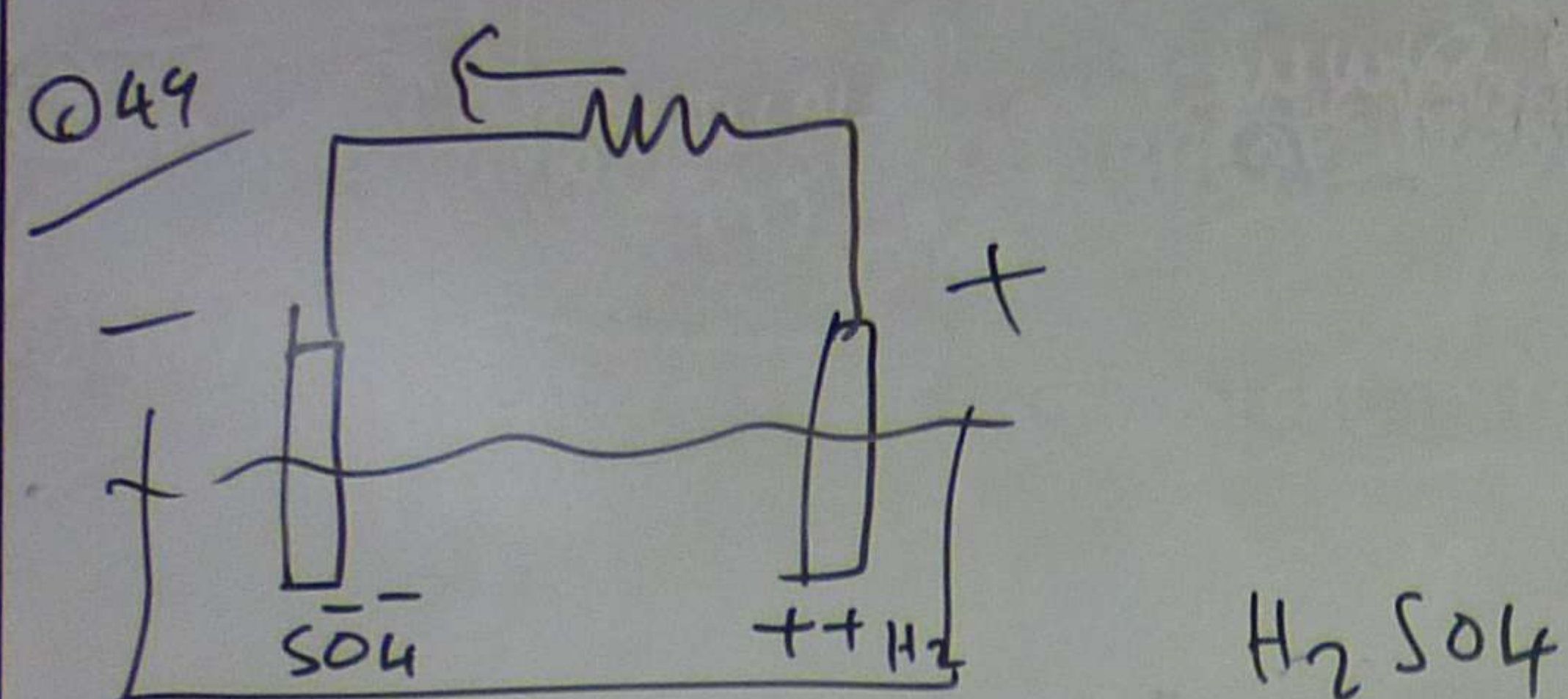




Volcanic gases have accelerated the corrosion of this abandoned mining machinery.







SPECIAL CHEMICAL REACTION WHICH OCCUR INSIDE THE ELECTRIC CELL RESULT IN OXIDATION AND REDUCTION OF THE SUBSTANCES INSIDE THE CELL THIS PRODUCES ELECTRICAL ENERGY. NORMAL BATTERIES WORK LIKE THIS

Q50 CORROSION IS THE GRADUAL DESTRUCTION OF MATERIALS USUALLY METALS BY CHEMICAL REACTION WITH IT'S ENVIRONMENT.

THIS MEANS ELECTRO-CHEMICAL OXIDATION

OF METALS IN REACTION WITH OXIDANT SUCH AS OXYGEN. RUSTING,

FORMATION OF IRON OXIDE IS A WELL KNOWN EXAMPLE OF OXIDATION.

### REFERENCE NOTES

www.electrical diploma 2013. zoomsh

EOB/ MATERIAL SCIENCE

✓ T6 NON METALLIC MATERIALS (PPT)

✓ T3 CONDUCTORS & SEMI CONDUCTOR

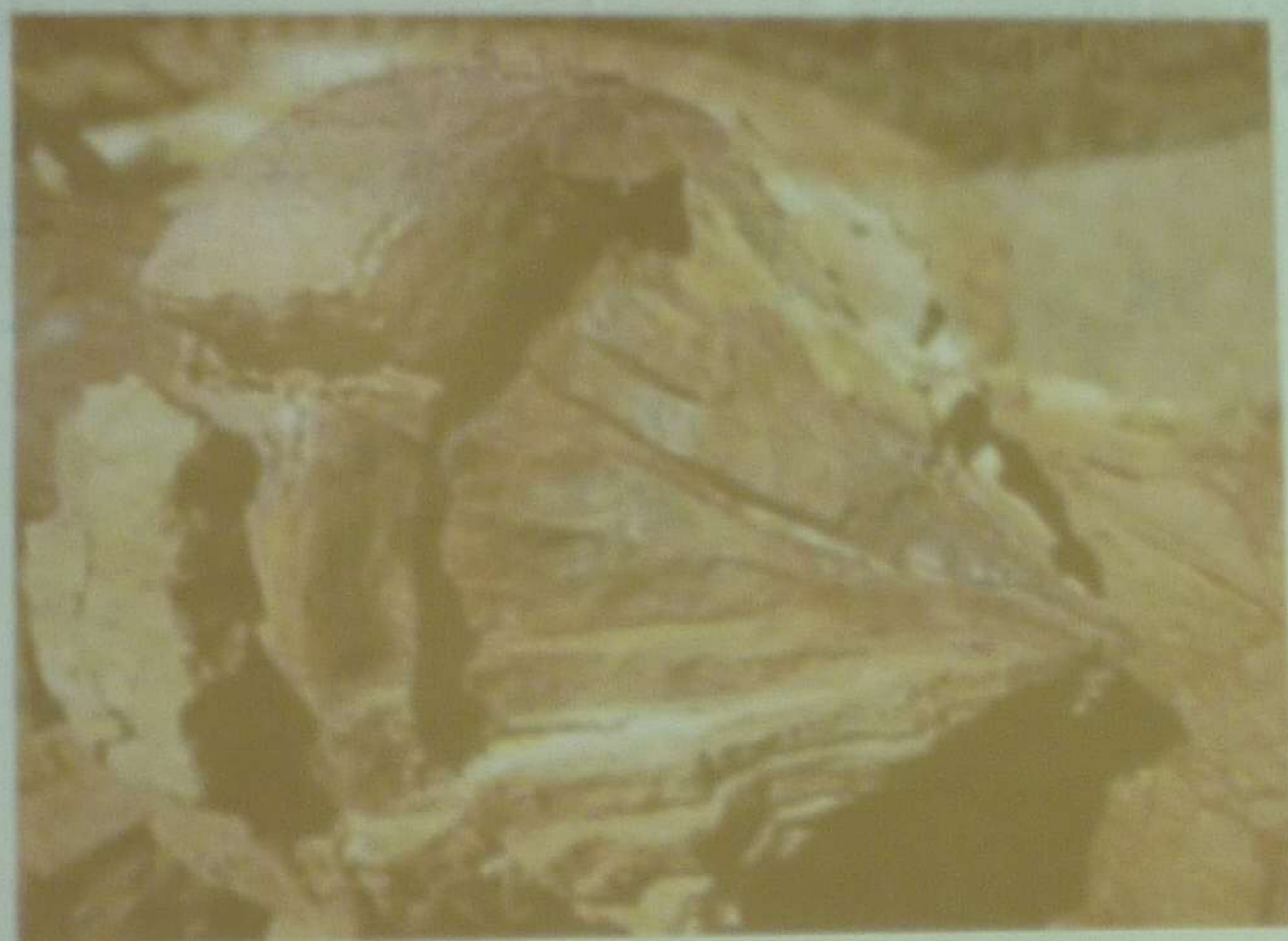
✓ T4 CHEMICAL EFFECT ON MATERIALS  
↳ CORROSION

T7 MANUFACTURING PROCESS & MATE

TEXT BOOK

PAGE 7 → 13

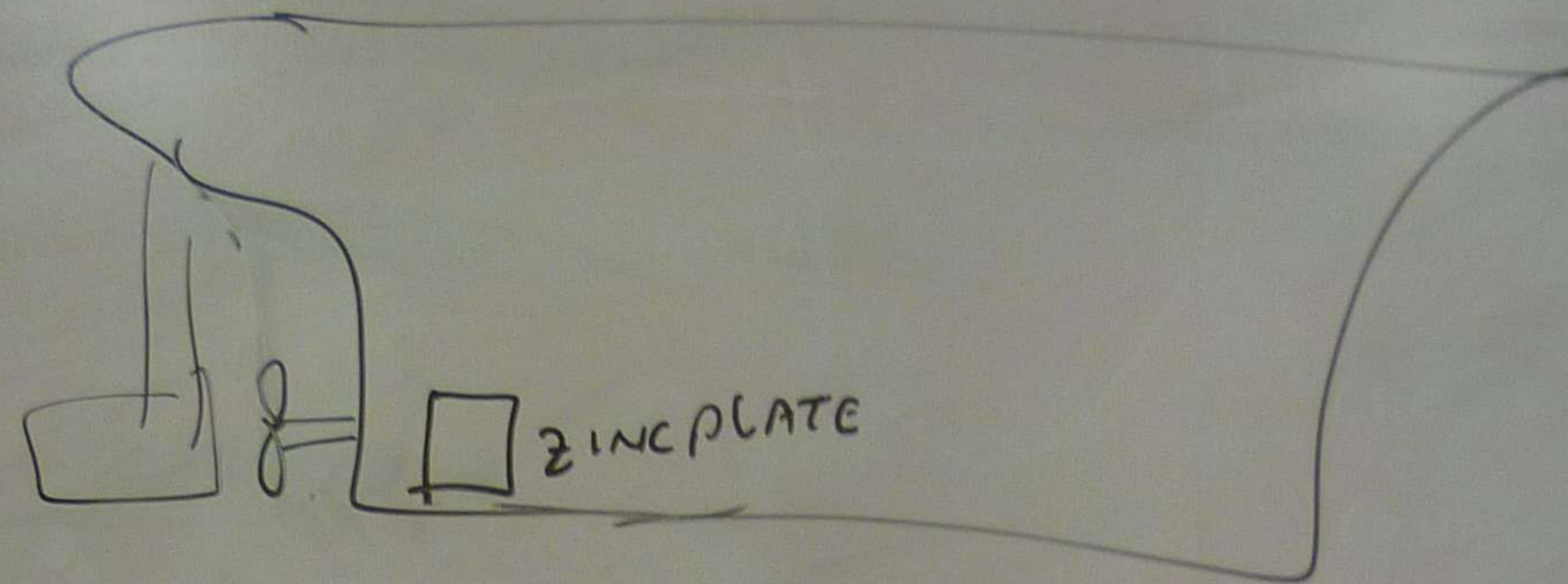




Volcanic gases have accelerated the corrosion of this abandoned mining machinery.







Q 51 (a) GALVANIC CORROSION OCCURS WHEN TWO DIFFERENT METALS HAVE PHYSICAL (OR) ELECTRICAL CONTACT WITH EACH OTHER AND ARE IMMERSED IN A COMMON ELECTROLYTE, OR WHEN THE SAME METAL IS EXPOSED TO ELECTROLYTE WITH DIFFERENT CONCENTRATIONS.

IN A GALVANIC COUPLE, THE MORE ACTIVE METAL (THE ANODE) CORRODES AT AN ACCELERATE RATE AND THE MORE NOBLE METAL (THE CATHODE) CORRODES AT A RETARDED RATE.



10.2.1 Glass corrosion tests

- [11 See also](#)
- [12 References](#)
- [13 Further reading](#)
- [14 External links](#)

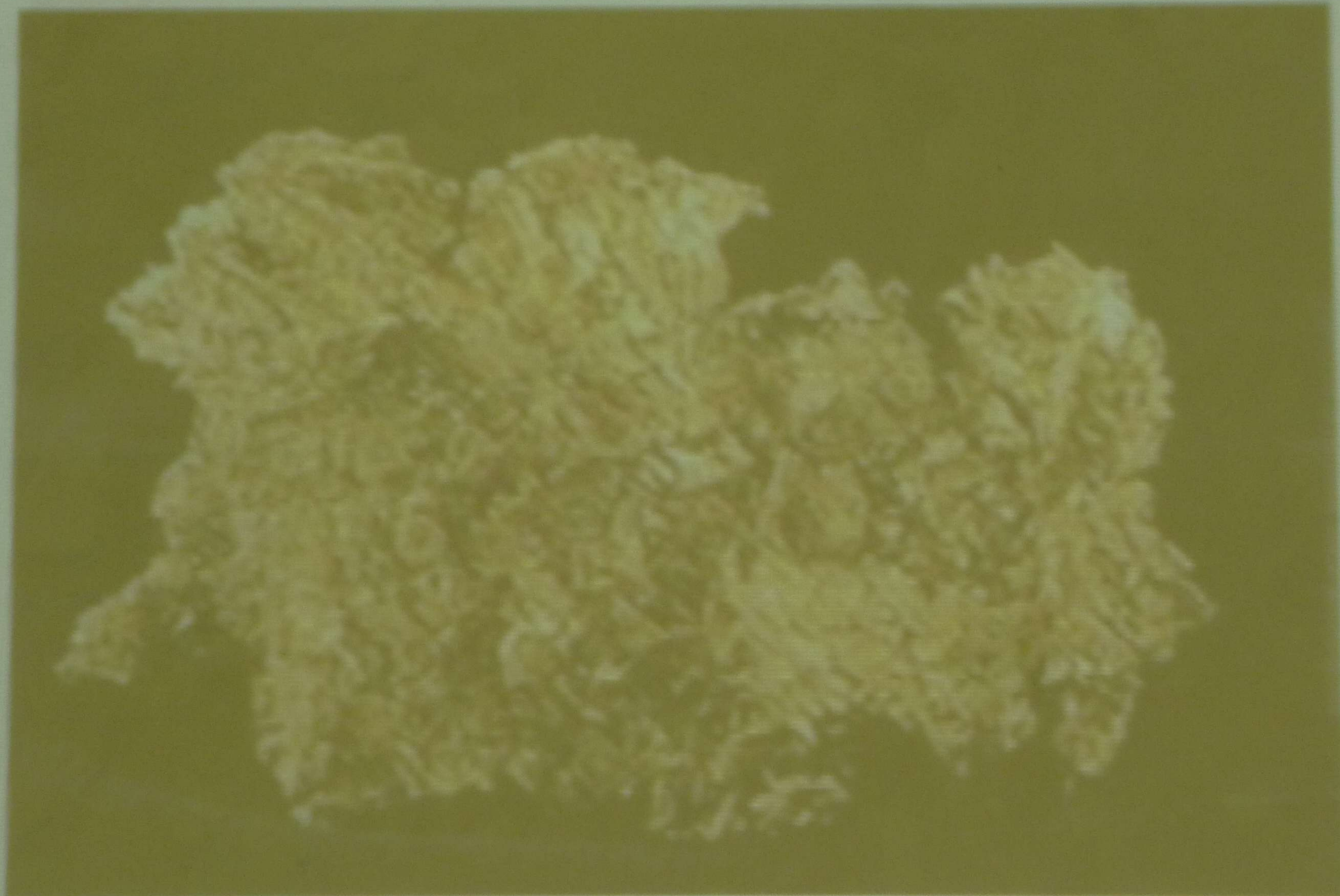
## **[edit] Galvanic corrosion**

*Main article: [Galvanic corrosion](#)*





## [edit] Intrinsic chemistry





Q51(b)

IT IS POSSIBLE TO CHEMICALLY REMOVE THE PRODUCTS OF CORROSION. FOR EXAMPLE, PHOSPHORIC ACID IN THE FORM OF NAVAL JELLY IS OFTEN APPLIED TO FERROUS TOOLS (OR) SURFACES TO REMOVE RUST.

Q51(c)

SOME METALS ARE MORE INTRINSICALLY RESISTANT TO CORROSION THAN OTHERS. THERE ARE VARIOUS WAYS OF PROTECTING METALS FROM CORROSION INCLUDING PAINTING, HOT DIP GALVANIZING AND COMBINATION OF THESE.



Q 51(b)

IT IS POSSIBLE TO CHEMICALLY REMOVE THE PRODUCTS OF CORROSION. FOR EXAMPLE, PHOSPHORIC ACID IN THE FORM OF NAVAL JELLY IS OFTEN APPLIED TO FERROUS TOOLS (OR) SURFACES TO REMOVE RUST.

Q 51(c)

SOME METALS ARE MORE INTRINSICALLY RESISTANT TO CORROSION THAN OTHERS. THERE ARE VARIOUS WAYS OF PROTECTING METALS FROM CORROSION INCLUDING PAINTING, HOT DIP GALVANIZING AND COMBINATION OF THESE.

Q 52

- REACTIVE COATING
- ANODIZATION
- BIO FILM COATING
- CATHODIC PROTECTION

- SACRIFICIAL ANODE PROTECTION
- IMPRESSED CURRENT CATHODIC PROTECTION.

(b) THE  
OF THE

CHEM

Q 49

Q 50

Q 51

Q 52

Q 53



## Base Polymer Tracking Resistance

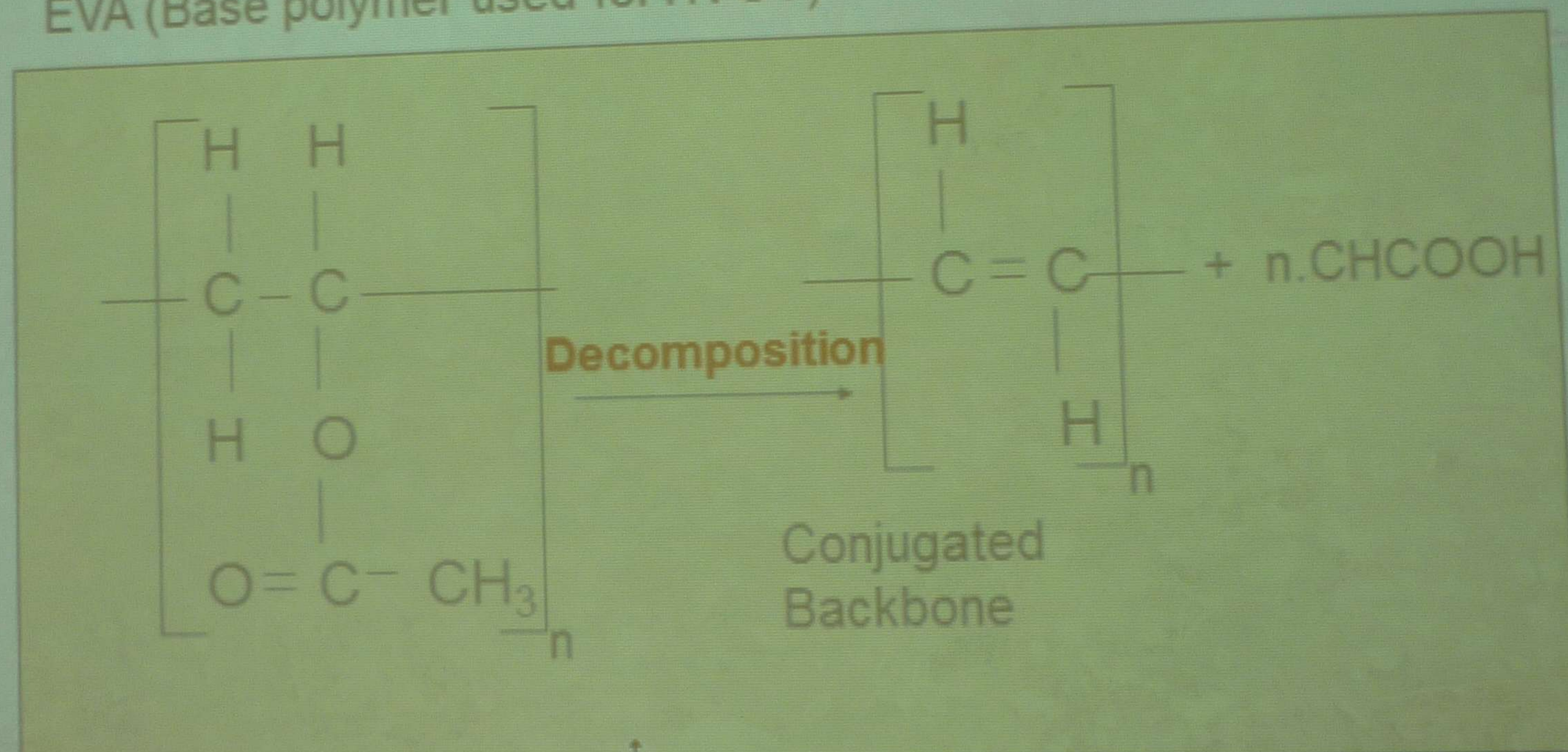
	<u>Dust-Fog (hours)</u>
Polyvinyl chloride	0.3
Polystyrene	0.9
Polyvinyl acetate	1
Polyethylene	33
Poly methyl methacrylate	162
Polytetrafluoroethylene	600

Tracking performance is associated with a materials tendency to form a conductive char residue on decomposition.



## Example Of A Track Prone Polymer

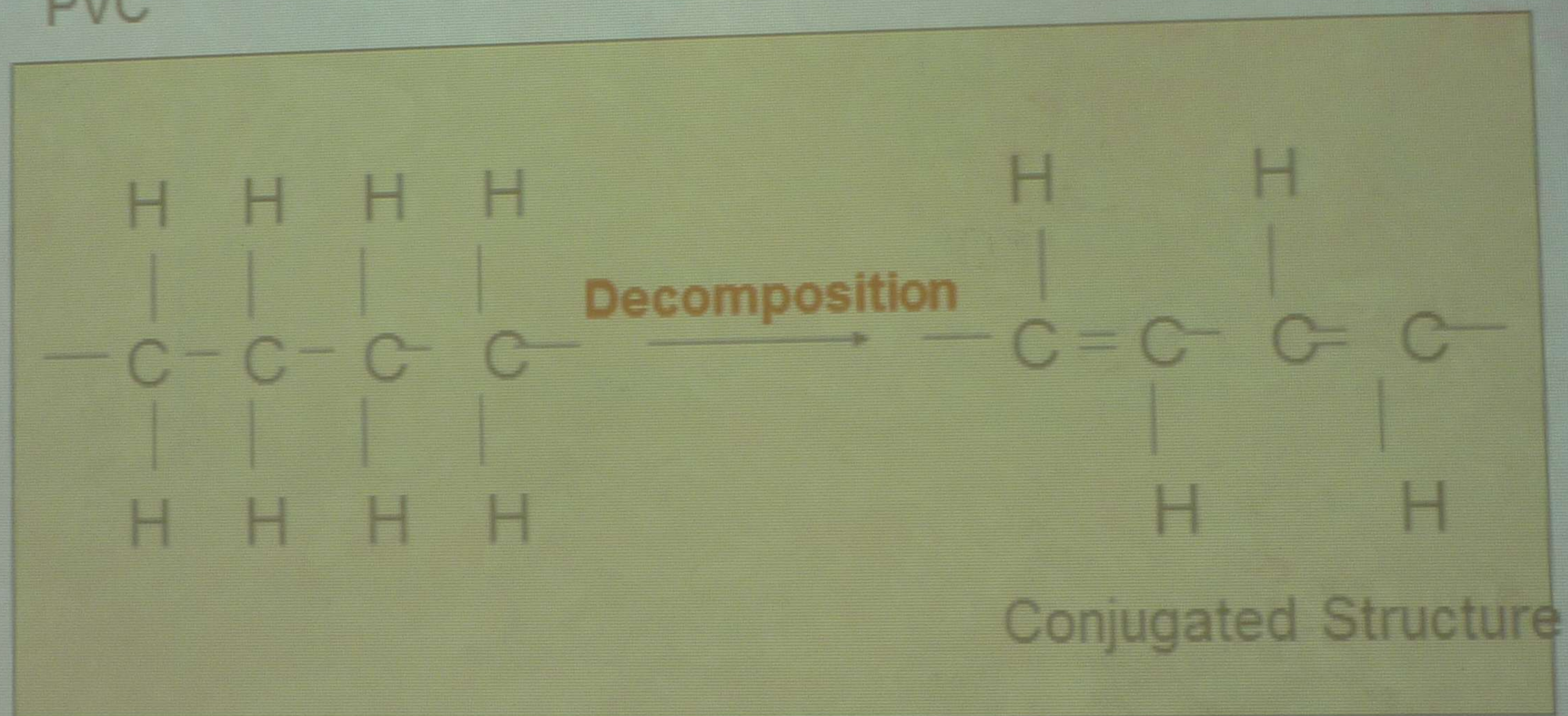
EVA (Base polymer used for HVOT)



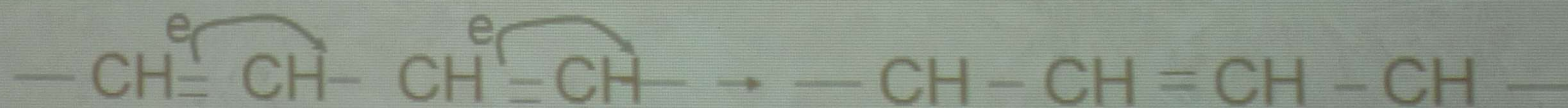


## Example Of A Track Prone Polymer

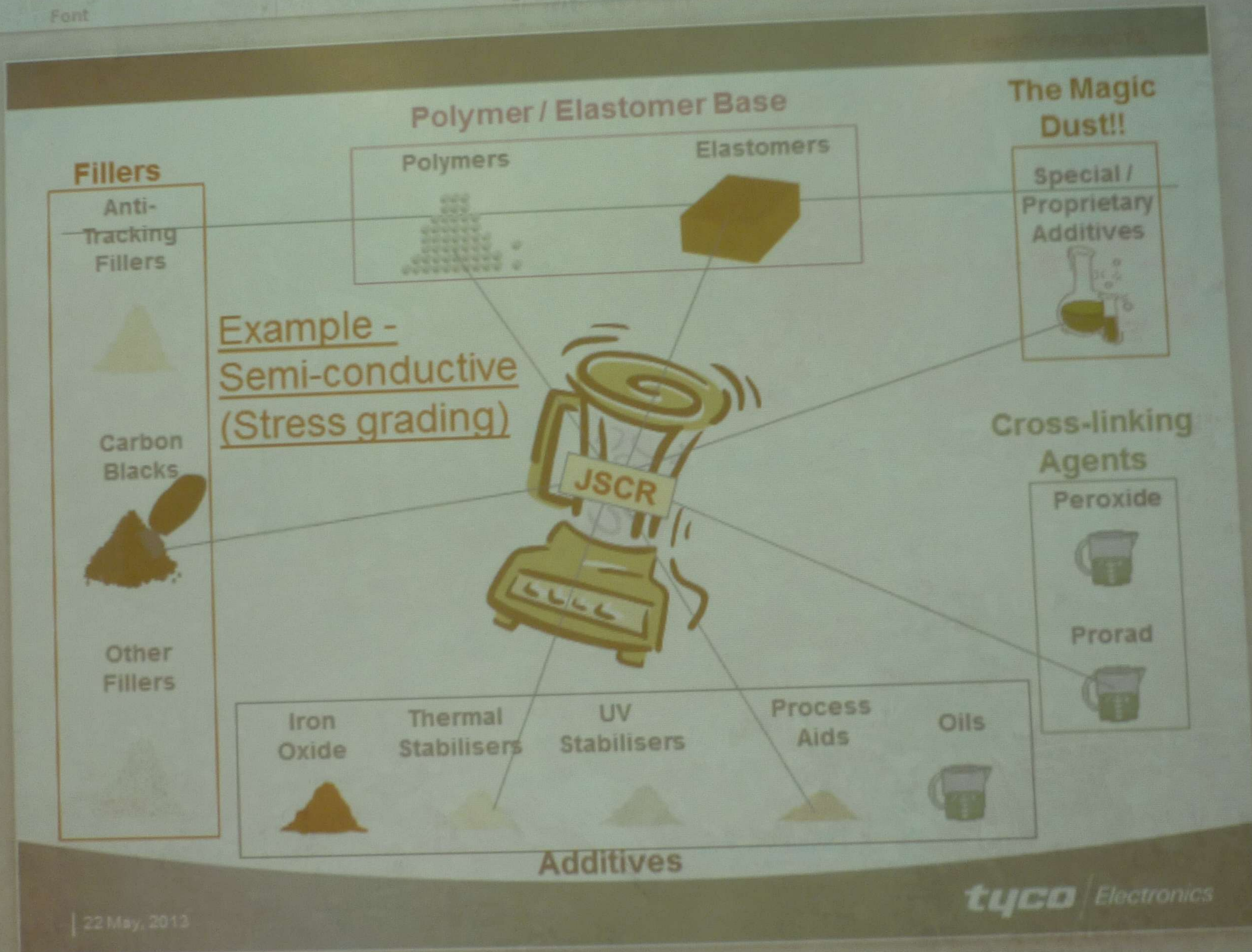
PVC



Conduction occurs via electron transfer:



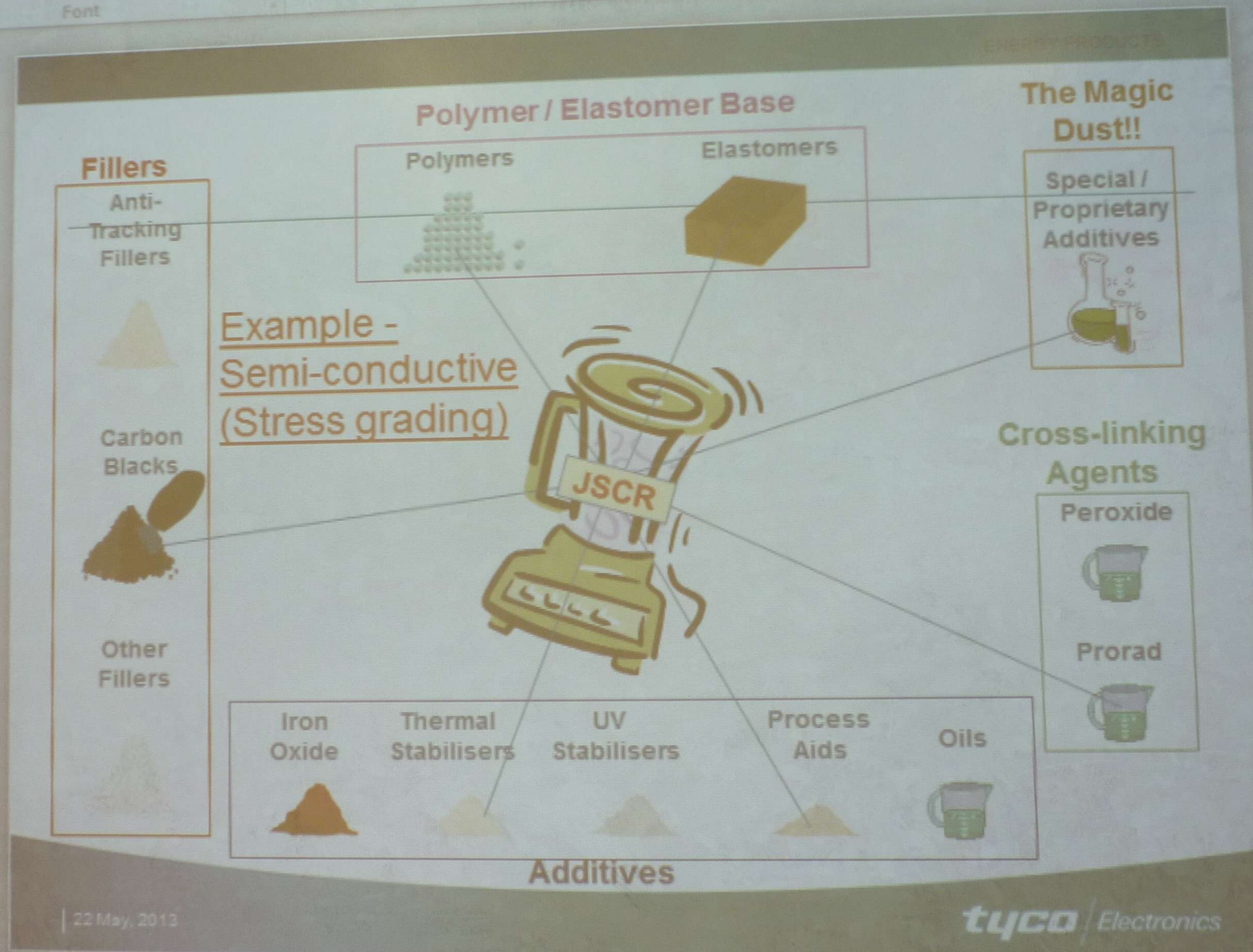




22 May, 2013

tyco Electronics





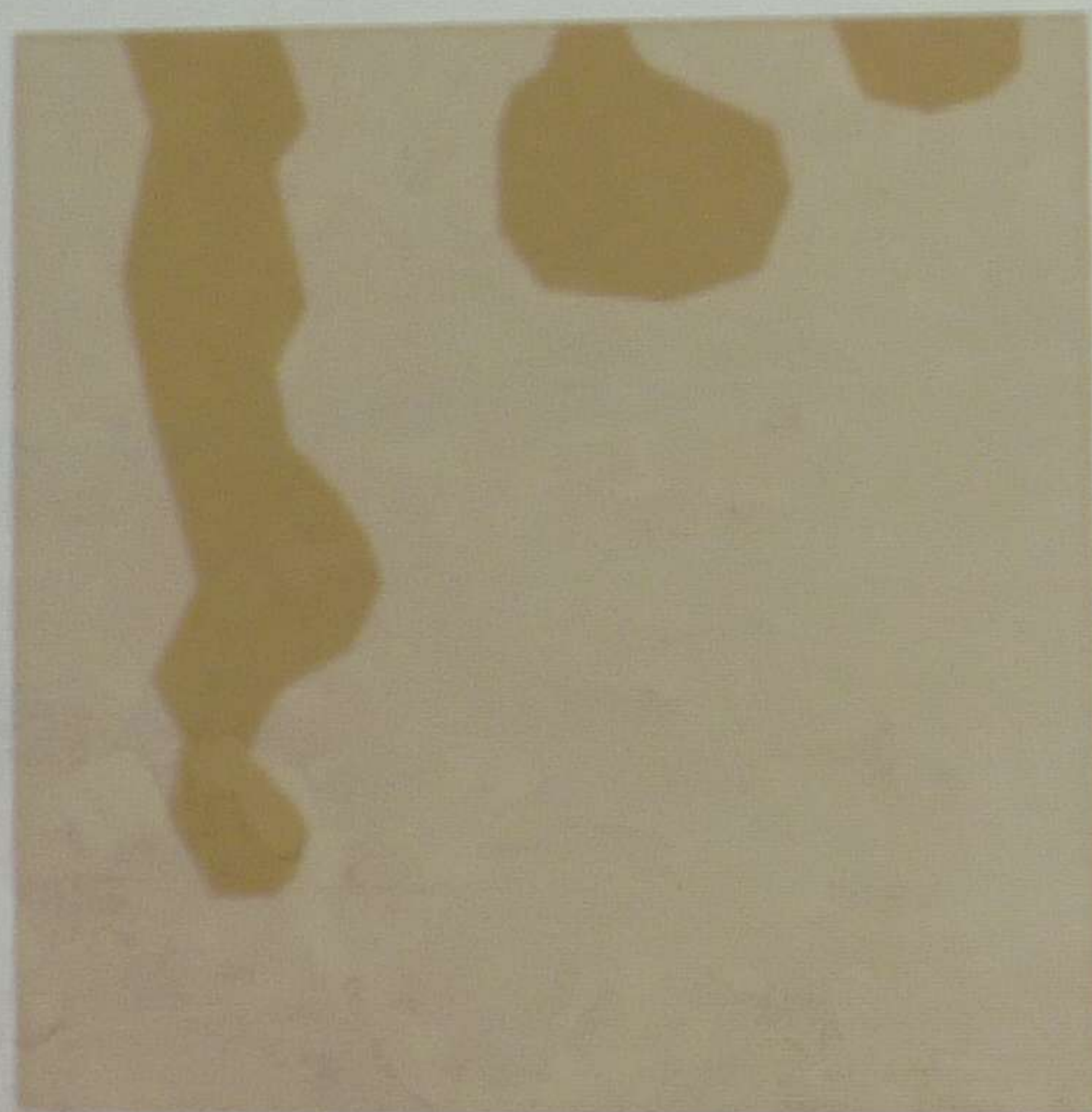


## [\[edit\]](#) Corrosion in passivated materials

Passivation is extremely useful in mitigating corrosion damage, however even a high-quality alloy will corrode if its ability to form a passivating film is hindered. Proper selection of the right grade of material for the specific environment is important for the long-lasting performance of this group of materials. If breakdown occurs in the passive film due to chemical or mechanical factors, the resulting major modes of corrosion may include pitting corrosion, crevice corrosion and stress corrosion cracking.

### [\[edit\]](#) Pitting corrosion

*Main article: [Pitting corrosion](#)*



The scheme of pitting corrosion

mshare.com

ot )

s  
n protection  
MATERIALS



Advanced ...



S:\UserData...



Materials p...



TS Chemi...



ME\_205\_Ma...



E081\_Mater...



TS Chemi...

TS Chemi...

TS Chemi...



its name implies, corrosion is limited to a very narrow zone adjacent to the weld, often only a few micrometers across, making it even less noticeable.

[\[edit\]](#) Crevice corrosion

Main article: [Crevice corrosion](#)



Corrosion in the crevice between the tube and tube sheet (both made of type-316 stainless steel) of a heat exchanger in a seawater desalination plant.<sup>[4]</sup>



UE THE PRODUCTS  
IN THE FORM OF  
OUS TOOLS (OR)

RESISTANT TO  
US WAYS OF  
NA PAINTING,  
THESE.

AL ANODE

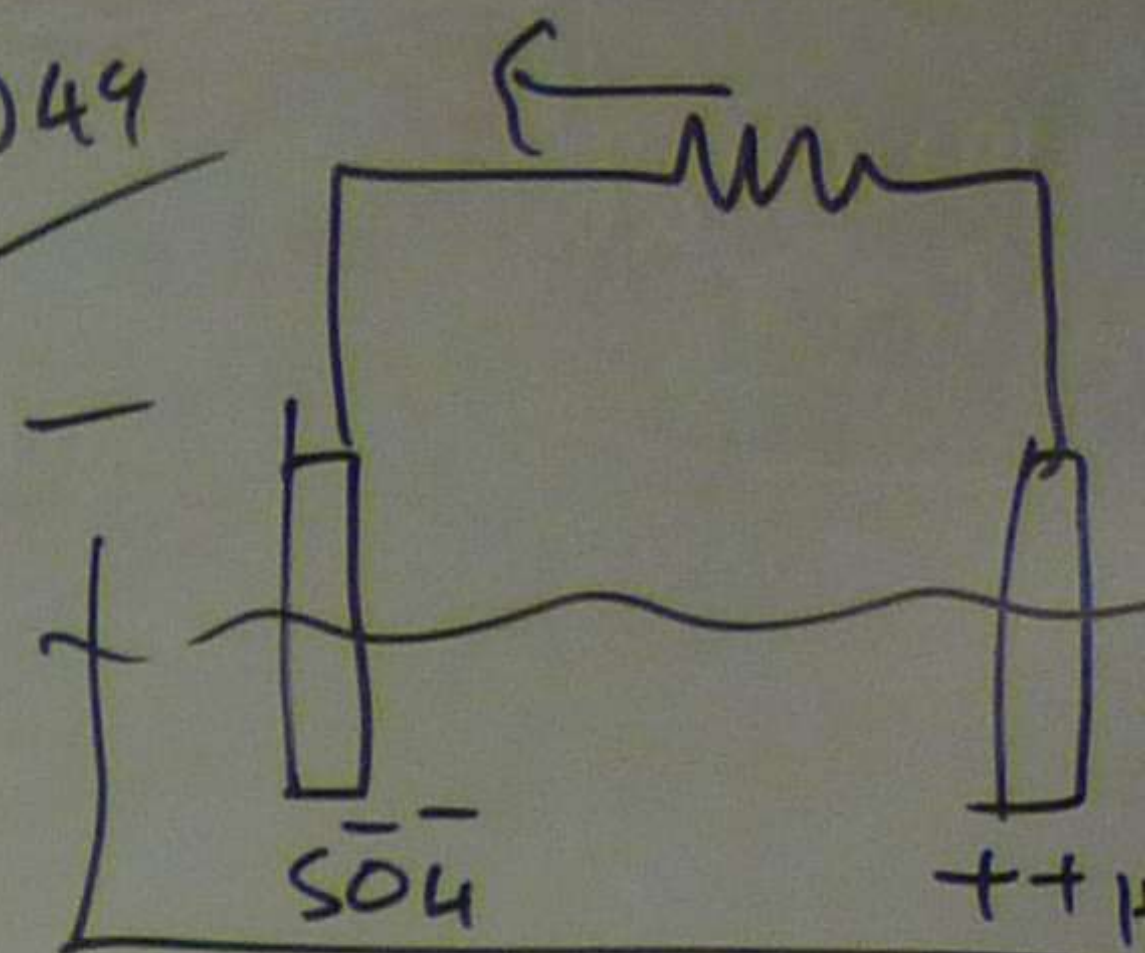
ED CURRENT  
PROTECTION.

### BASE POLYMER TRACKING RESISTANCE

- Q53

- PITTING CORROSION
- CREVICE CORROSION
- MICROBIAL CORROSION
- HIGH TEMPERATURE CORROSION
- METAL DUSTING

Q49



SPECIAL CHEM  
OCCUR INSIDE  
RESULT IN OXI  
OF THE SUBST  
THIS PRODUCES  
NORMAL BATT

Q50 CORROSION  
DESTRUCTION

USUALLY  
REACTION W  
THIS MEANS  
OF METAL  
OXIDANT S



RESISTANCE

EROSION

CRACKING

Following

STEEL (C) ALUMINIUM

Q54

STRESS CORROSION CRACKING

(SCC) IS CAUSED BY THE SIMULTANEOUS EFFECTS OF TENSILE STRESS AND A SPECIFIC CORROSIVE ENVIRONMENT. STRESSES MAY BE DUE TO APPLIED LOADS. RESIDUAL STRESSES FROM THE MANUFACTURING PROCESS (OR) COMBINATION OF BOTH.

REFERENCE NOTE

www.electrical dip

EOB/ MATERIAL S

NON METALLIC MA

T3 CONDUCTORS &

T4 CHEMICAL EFFE

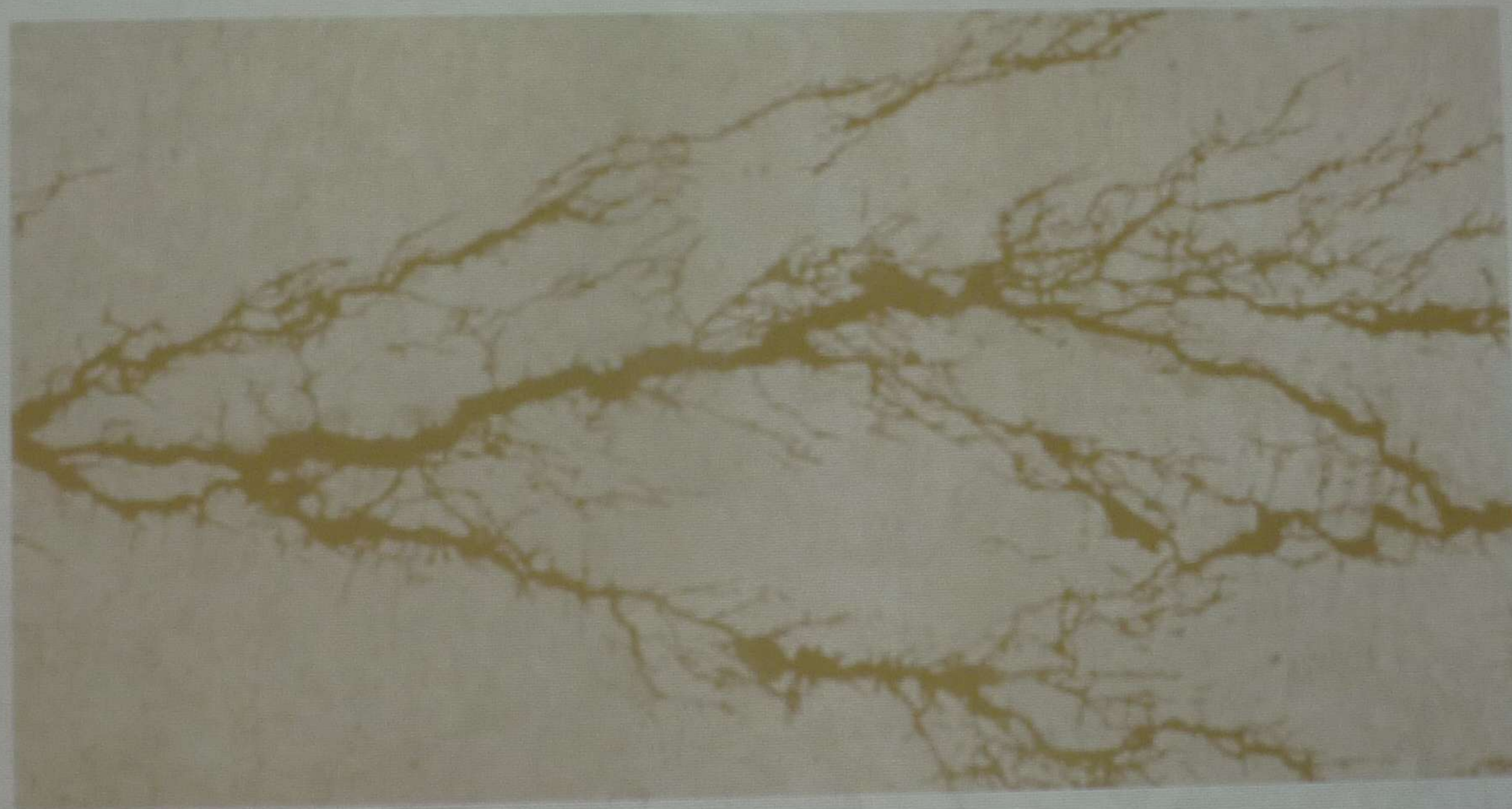
T7 MANUFACTURING



The picture on the left shows exfoliation of aluminum. Exfoliation of carbon steel is apparent in the channel on the coating exposure panel on the right. The expansion of the metal caused by exfoliation corrosion can create stresses that bend or break connections and lead to structural failure.

## Stress Corrosion Cracking

Stress corrosion cracking (SCC) is caused by the simultaneous effects of tensile stress and a specific corrosive environment. Stresses may be due to applied loads, residual stresses from the manufacturing process, or a combination of both.



Cross sections of SCC frequently show branched cracks. This river branching pattern is unique to SCC and is used in failure analysis to identify when this form of corrosion has occurred.

The photo below shows SCC of an insulated stainless-steel condensate line. Water wetted the insulation and caused chlorides to leech from the insulation onto the hot metal surface. This is a



chemically remove the products  
phosphoric acid in the form of  
applied to ferrous tools (or)

intrinsically resistant to  
are various ways of  
corrosion including painting,  
combination of these.

- sacrificial anode protection
- impressed current cathodic protection.

### BASE POLYMER TRACKING RESISTANCE

Q53

- PITTING CORROSION
- CREVICE CORROSION
- MICROBIAL CORROSION
- HIGH TEMPERATURE CORROSION
- METAL DUSTING

Q54 EXPRESS STRESS CORROSION CRACKING

Q55 WRITE NOTES FOR THE FOLLOWINGS

- (a) CARBON STEEL (b) STAINLESS STEEL (c) ALUMINIUM  
(d) COPPER ALLOY.

Q54

STRE

(SCC) IS  
EFFECTS OF  
A SPECIFIC  
STRESSES  
LOADS. RE  
MANUFACT  
OF BOTH.

Q55

(a)

MOST L  
MADE  
MIXING  
CARBO  
CAPAB  
SOME  
SUBJ  
COR



Q54

### STRESS CORROSION CRACKING

(SCC) IS CAUSED BY THE SIMULTANEOUS EFFECTS OF TENSILE STRESS AND A SPECIFIC CORROSIVE ENVIRONMENT. STRESSES MAY BE DUE TO APPLIED LOADS. RESIDUAL STRESSES FROM THE MANUFACTURING PROCESS (OR) COMBINATION OF BOTH.

Q55 (a) CARBON STEEL

MOST LARGE METAL STRUCTURES ARE MADE FROM CARBON STEEL MIXING THE STEEL WITH APPROPRIATE CARBON CONTENT, CORROSION PROTECTION CAPABILITY CAN BE ACHIEVED.

SOME FORMS OF CARBON STEELS ARE SUBJECT TO SPECIAL TYPES OF CORROSION SUCH AS HYDROGEN EMBRITTLEMENT

— PROTECTIVE COATING, CATHODIC PROTECTION AND CORROSION INHIBITORS ARE ALL EXTENSIVELY USED TO PROLONG THE LIFE OF CARBON STEEL STRUCTURES

(b) STAINLESS STEELS ARE BASED ON THE FORMULA OF IRON WITH 18% CHROMIUM AND 8% NICKEL. THEY ARE IMMUNE TO CORROSION BUT STAINLESS STEELS ARE SUBJECT TO PITTING, CREVICE CORROSION AND STRESS CORROSION CRACKING

(c) — FAVOURABLE STRENGTH TO WEIGHT RATIO  
— AEROSPACE APPLICATION

(d) BRASSES AND BRONZES ARE COMMONLY  
COPPER + ZINC      COPPER + TIN

USED FOR VALVES AND FITTINGS BUT THEY CAN FACE STRESS CORROSION CRACKING IN THE PRESENCE OF AMMONIA COMPOUNDS.



Q54

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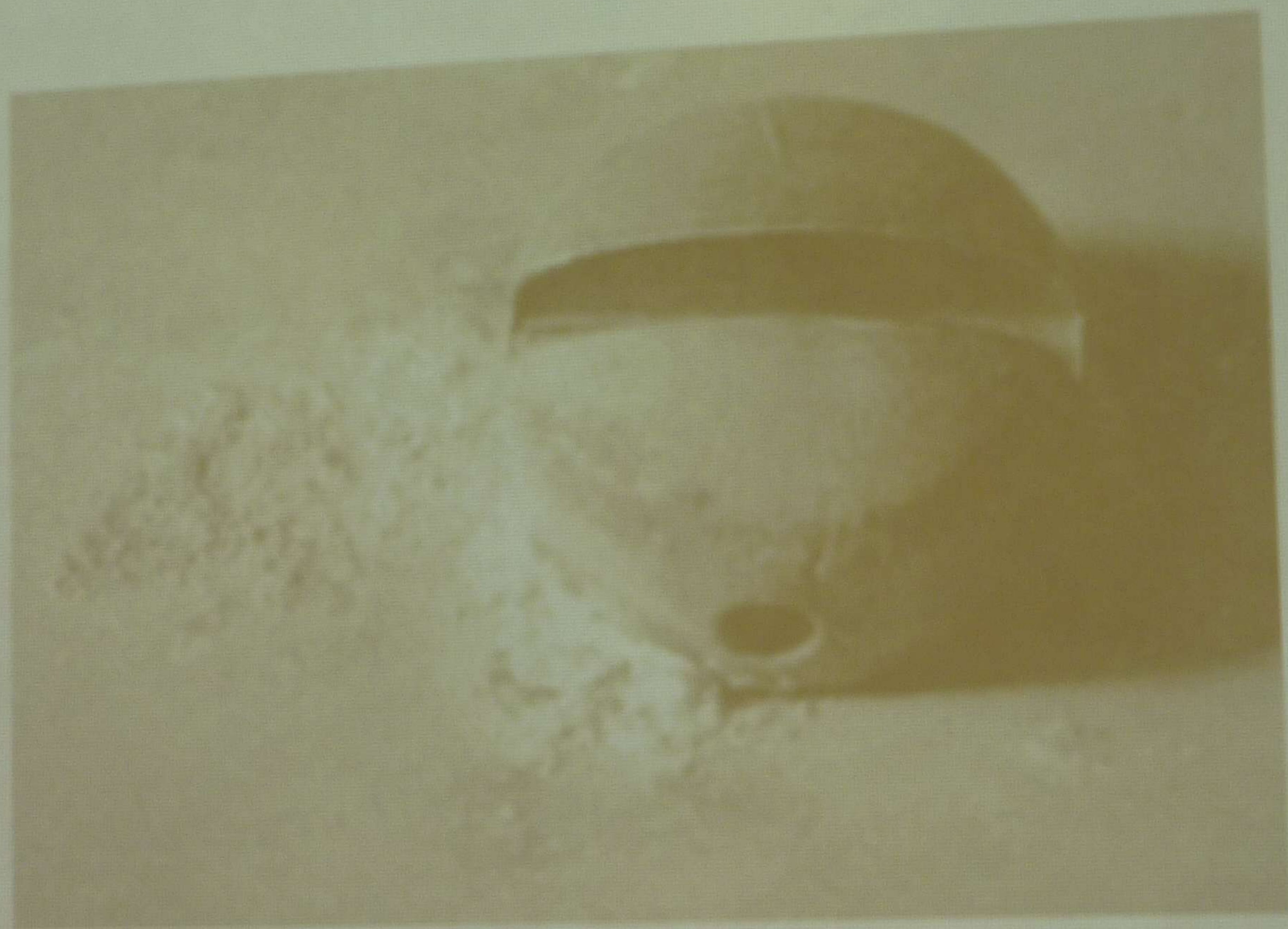
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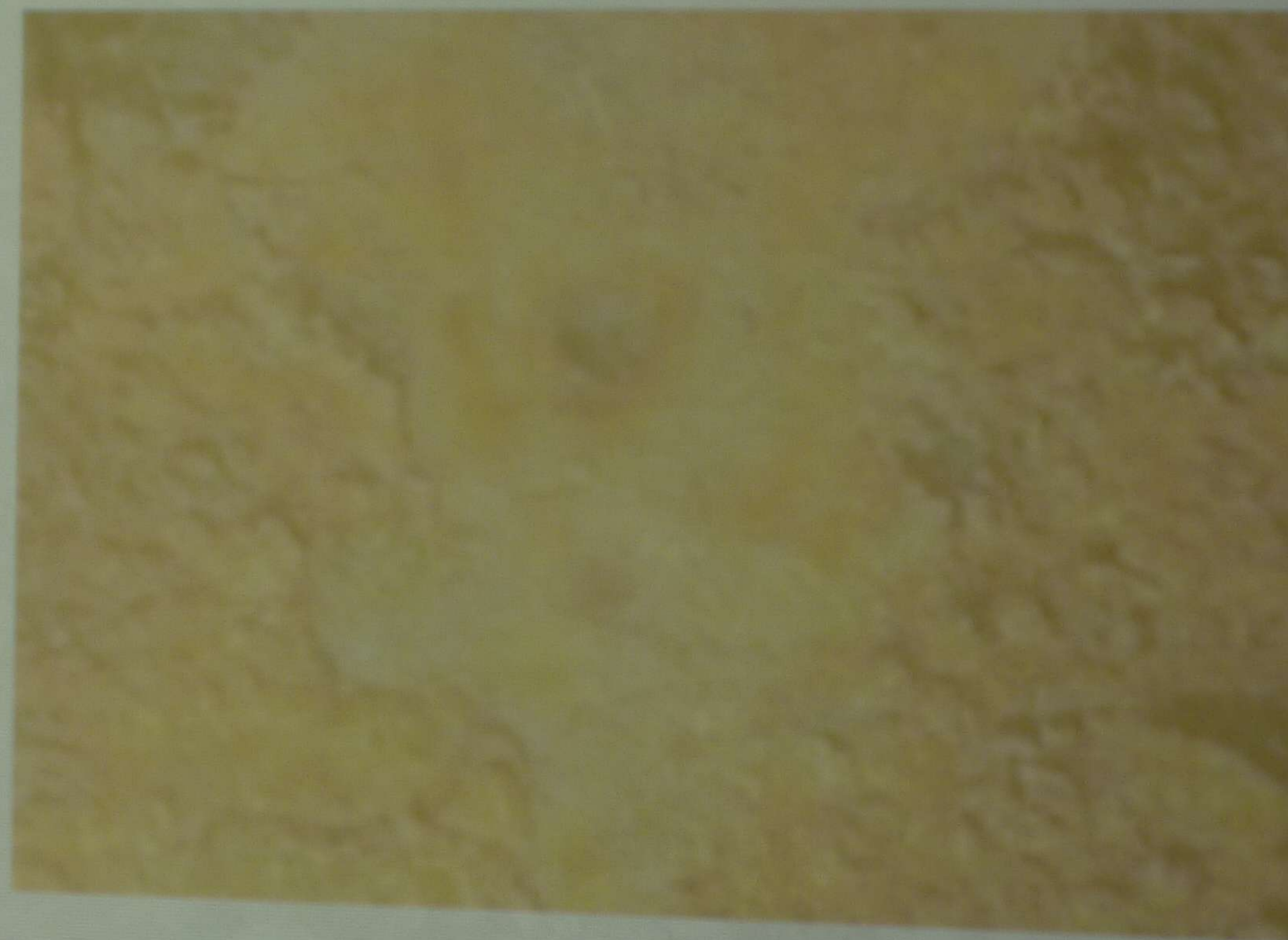
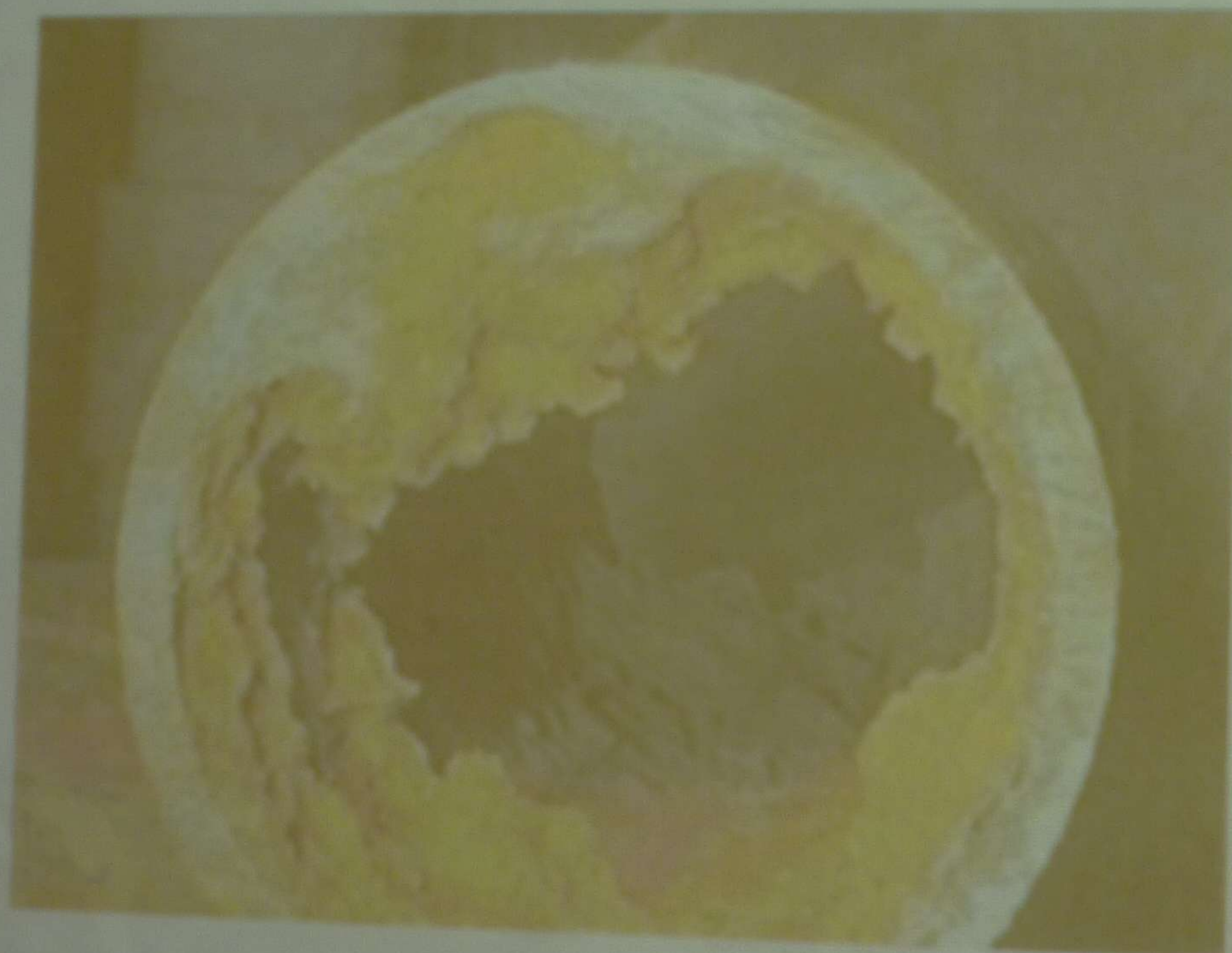


## Concentration Cell Corrosion

Concentration cell corrosion occurs when two or more areas of a metal surface are in contact with different concentrations of the same solution. There are three general types of concentration cell



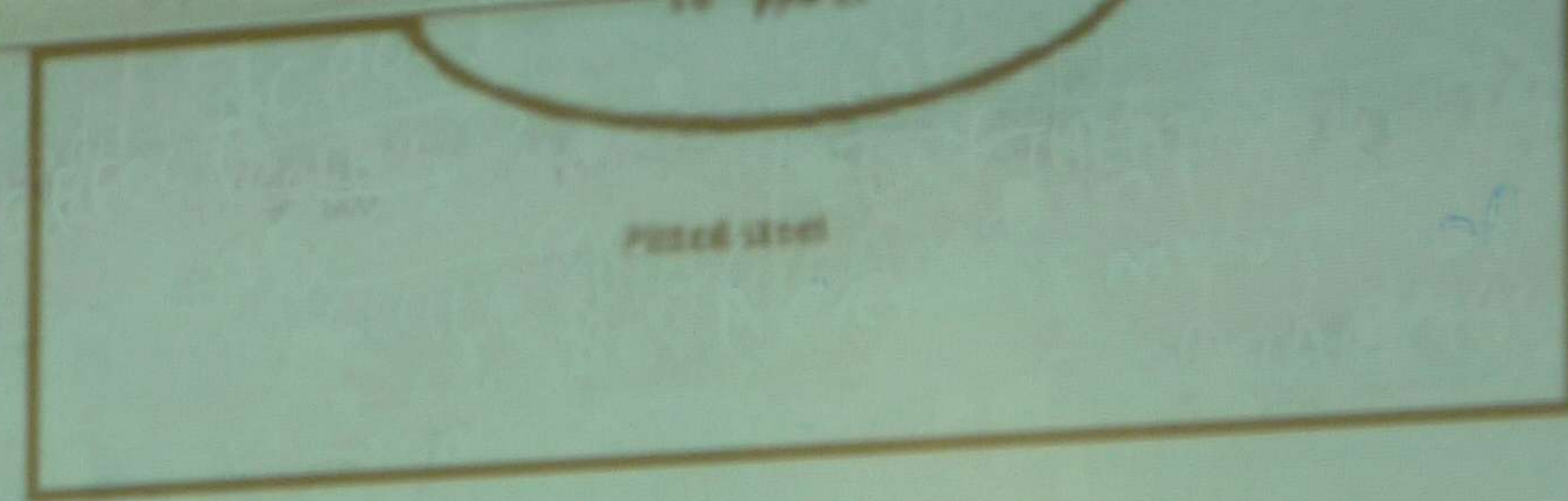
that can be used to control pitting include maintaining clean surfaces, application of a protective coating, and use of inhibitors or cathodic protection for immersion service. Molybdenum additions to stainless steel (e.g. in 316 stainless) are intended to reduce pitting corrosion.



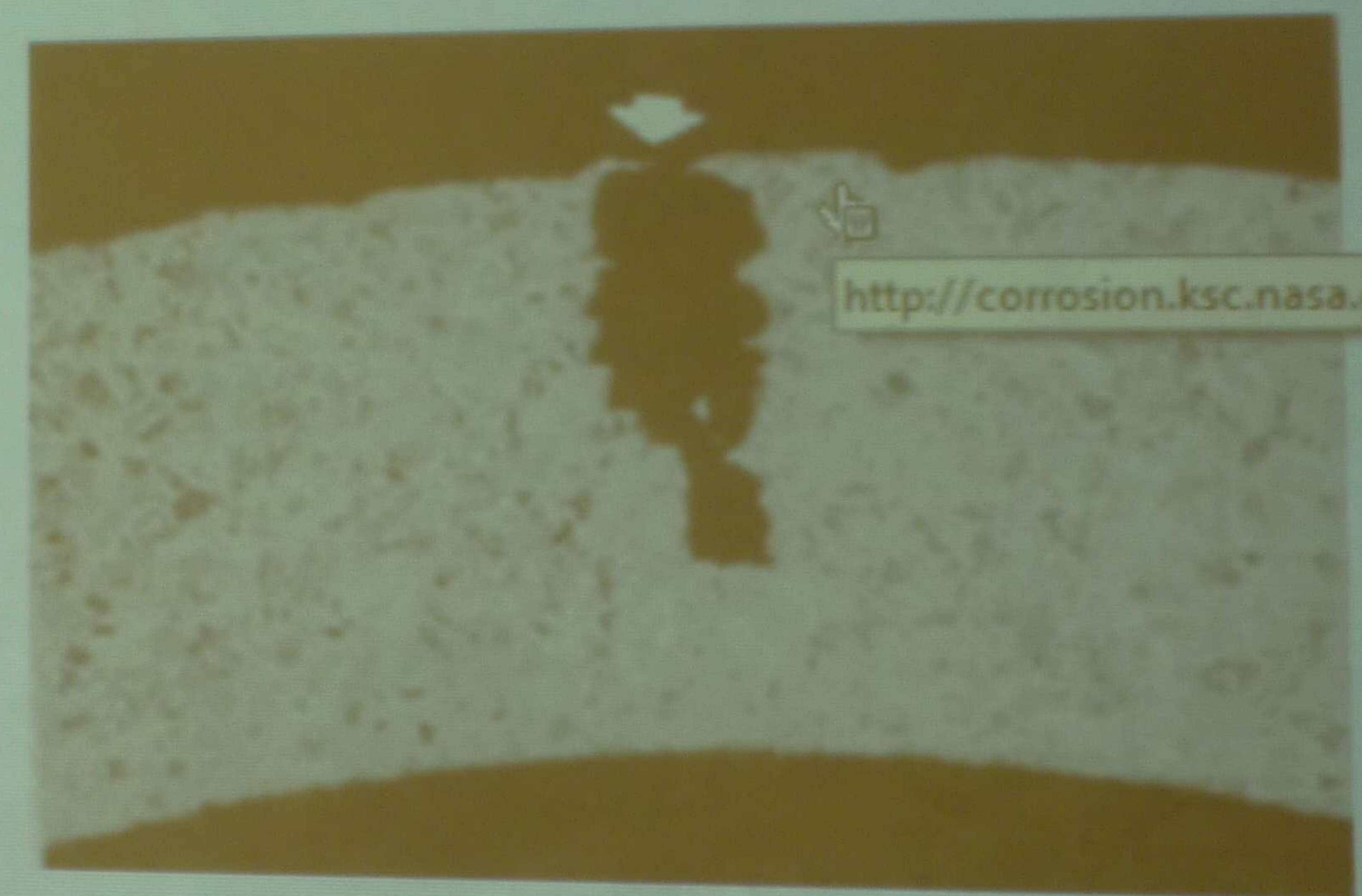
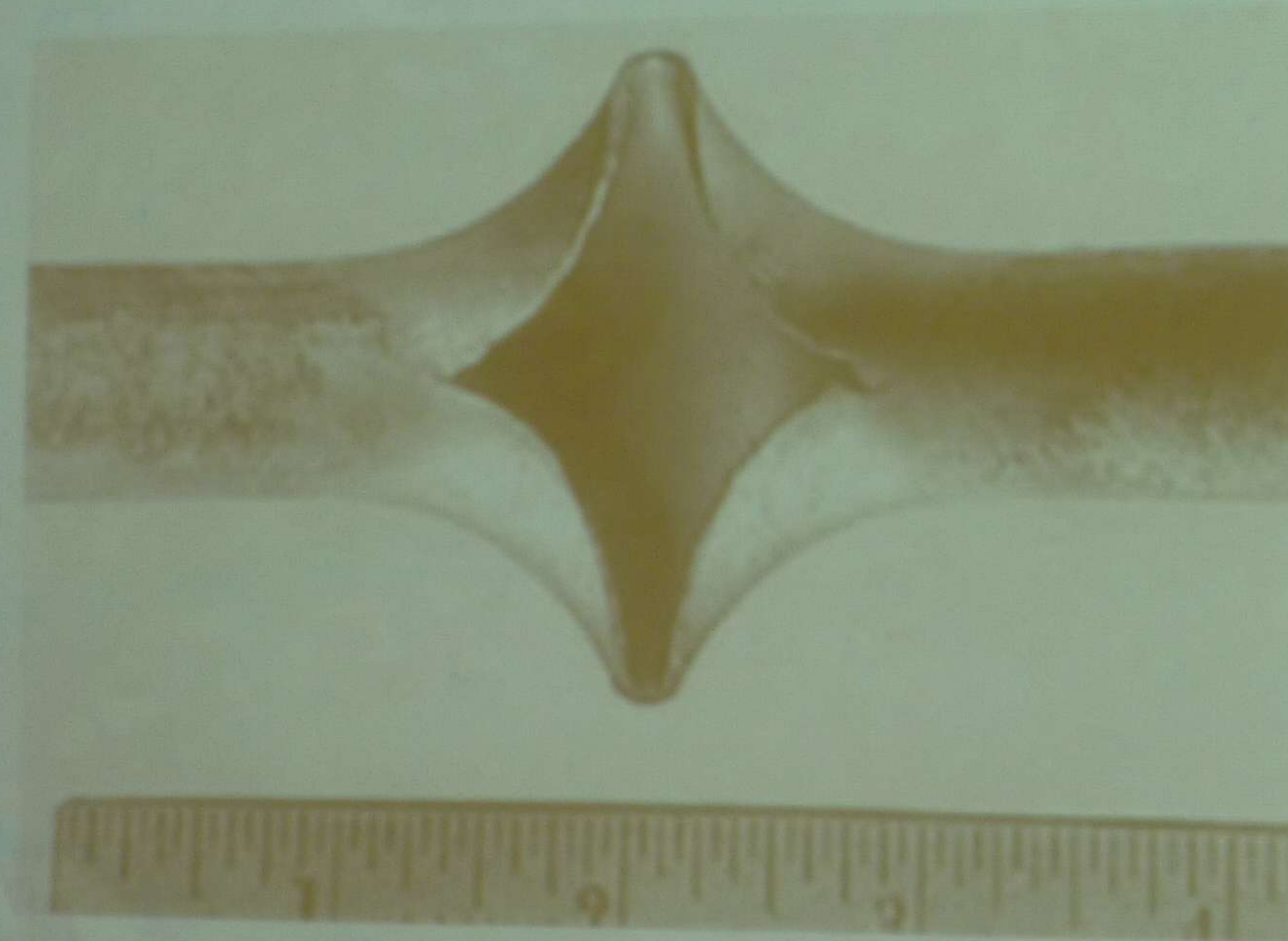
(Courtesy of [www.eci-ndt.com](http://www.eci-ndt.com))

The rust bubbles or tubercles on the cast iron above indicate that pitting is occurring. Researchers have found that the environment inside the rust bubbles is almost always higher in chlorid  
lower in pH (more acidic) than the





Similar changes in environment occur inside crevices, stress corrosion cracks, and corrosion fatigue cracks. All of these forms of corrosion are sometimes included in the term "occluded cell corrosion."

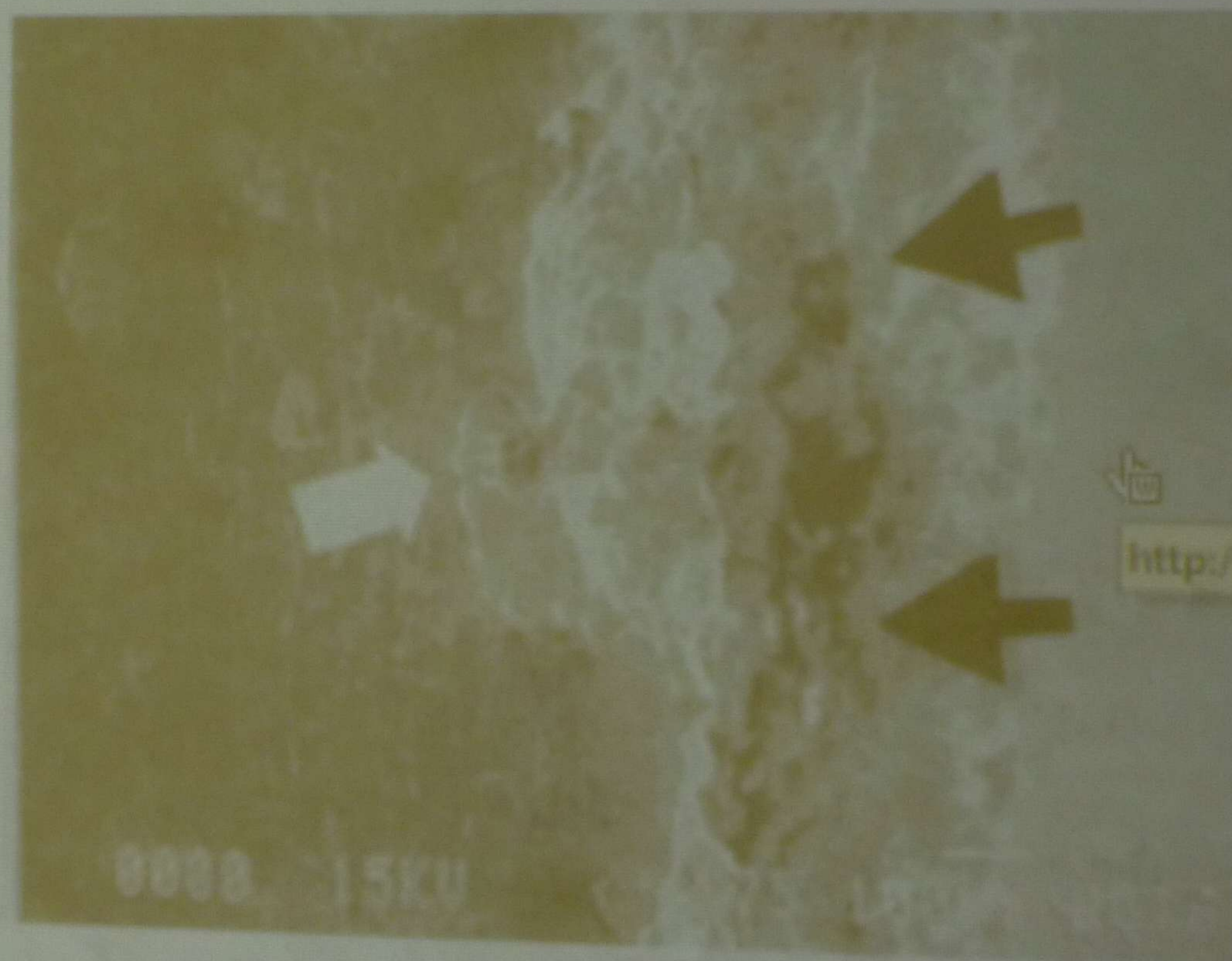
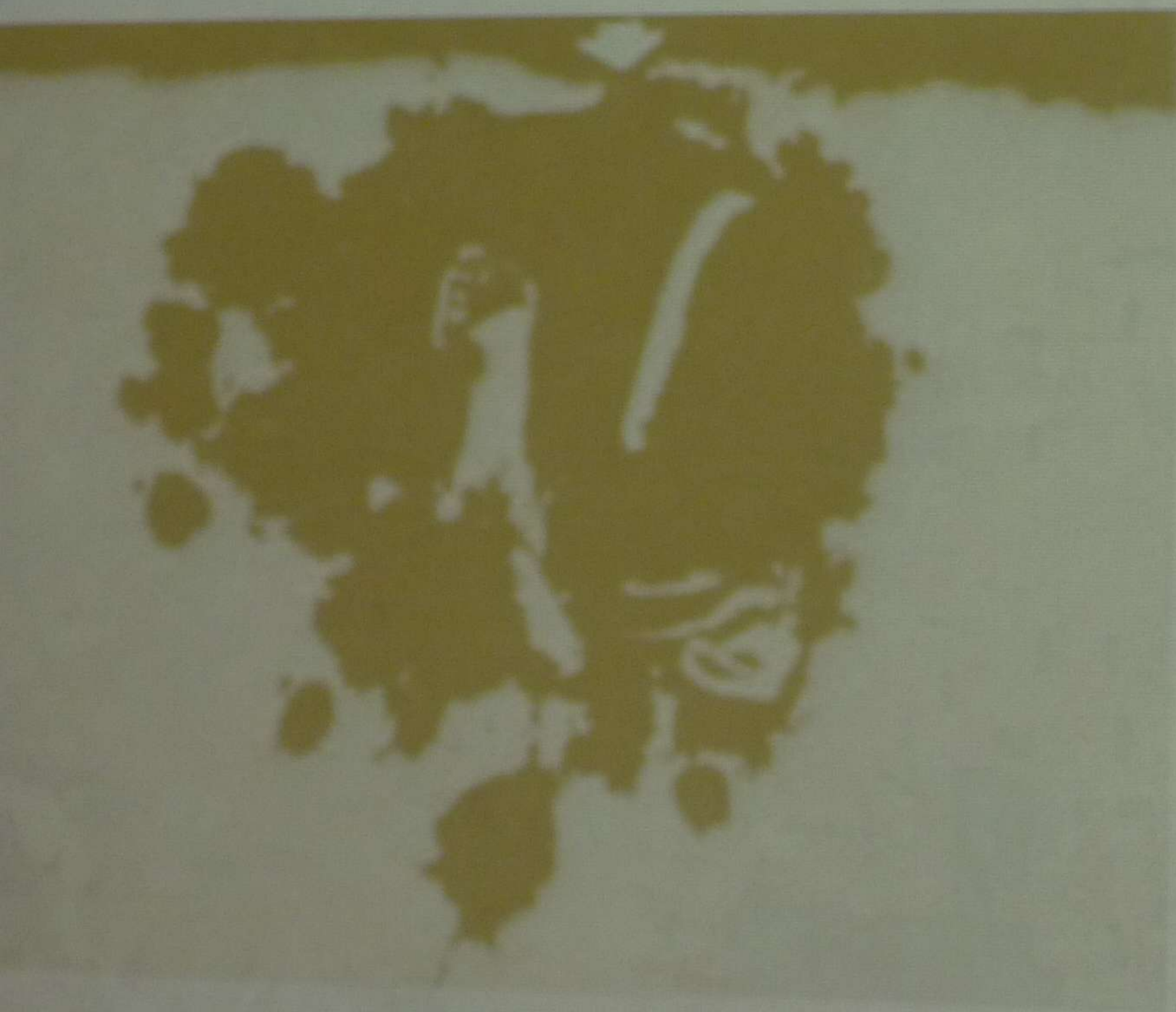


Pitting corrosion can lead to unexpected catastrophic system failure. The split tubing above left was caused by pitting corrosion of stainless steel. A typical pit on this tubing is shown above right.

Sometimes pitting corrosion can be quite small on the surface and very large below the surface. The figure below left shows this effect, which is common on stainless steels and other films.



als. The pitting shown below right (white arrow) led to the stress corrosion fracture shown by the black arrows.



<http://corrosion.ksc.nasa.gov>

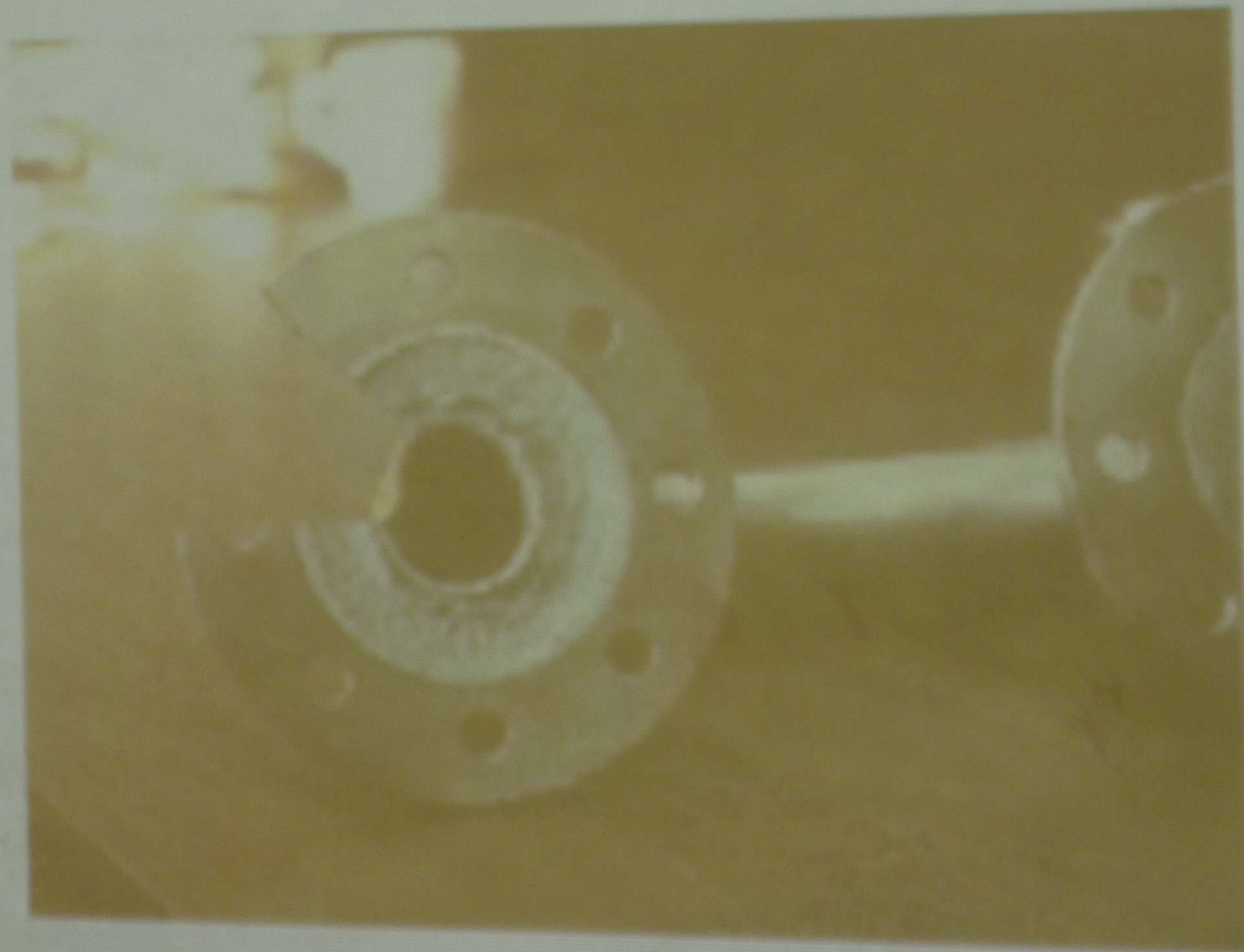
Complete discussion of this corrosion is contained in Steven J. McDanel, "Failure Analysis Of Launch Pad Tubing From The Kennedy Space Center," Microstructural Science, Vol. 25, 1998, ASM International, Materials Park, OH, pp. 125-129.

Crevice Corrosion



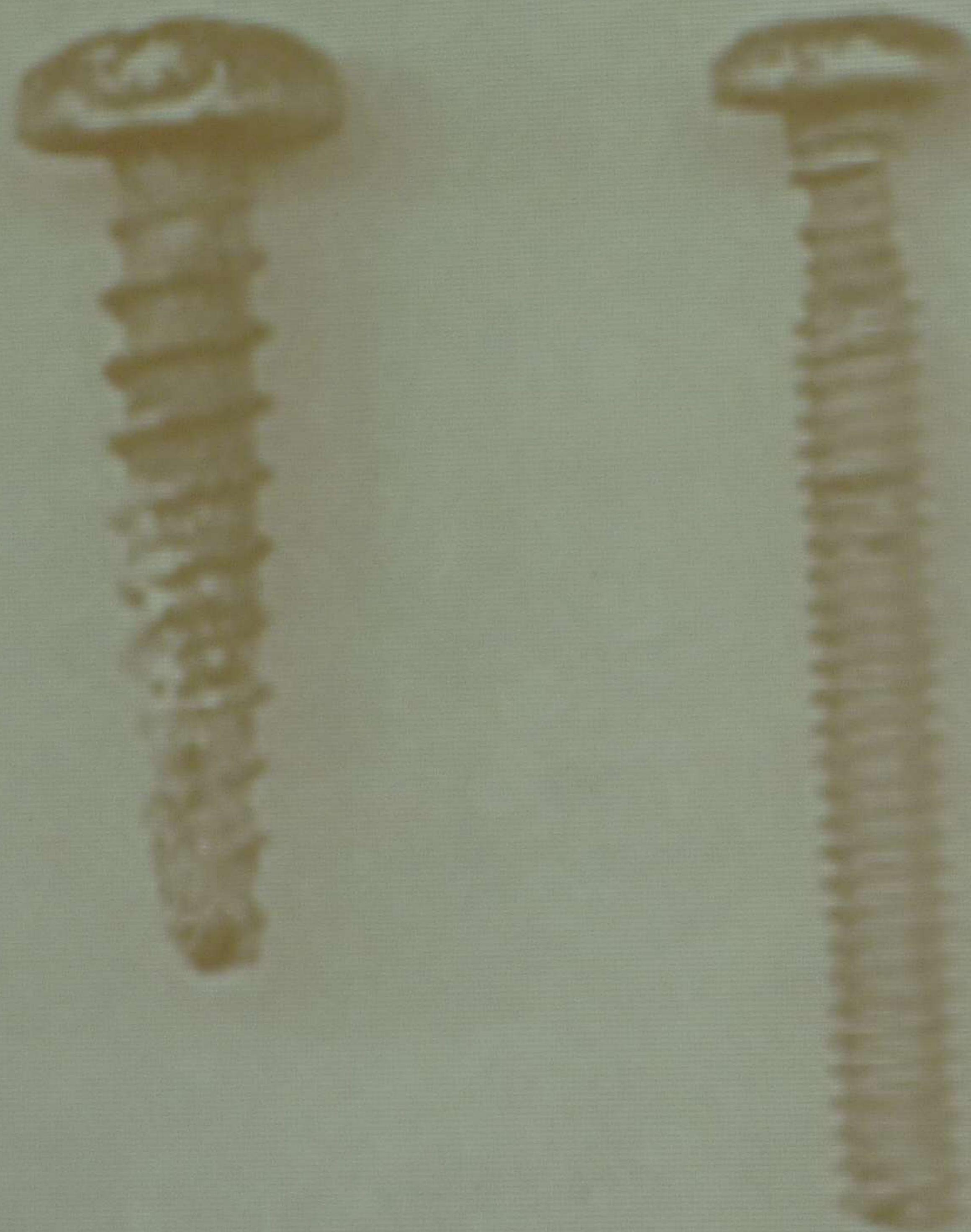
contact corrosion is common with nonmetals. It may occur at washers, under barnacles, at sealant films, and at pockets formed by threaded joints. Whether or not stainless steels are they are always susceptible to this kind of corrosion because a nucleus is not necessary.

s, the proper use of sealants, and protective coatings are effective means of controlling corrosion. Molybdenum-containing grades of stainless steel (e.g. 316 and 316L) have increased corrosion resistance.



ce corrosion shown above happened when an aerospace alloy

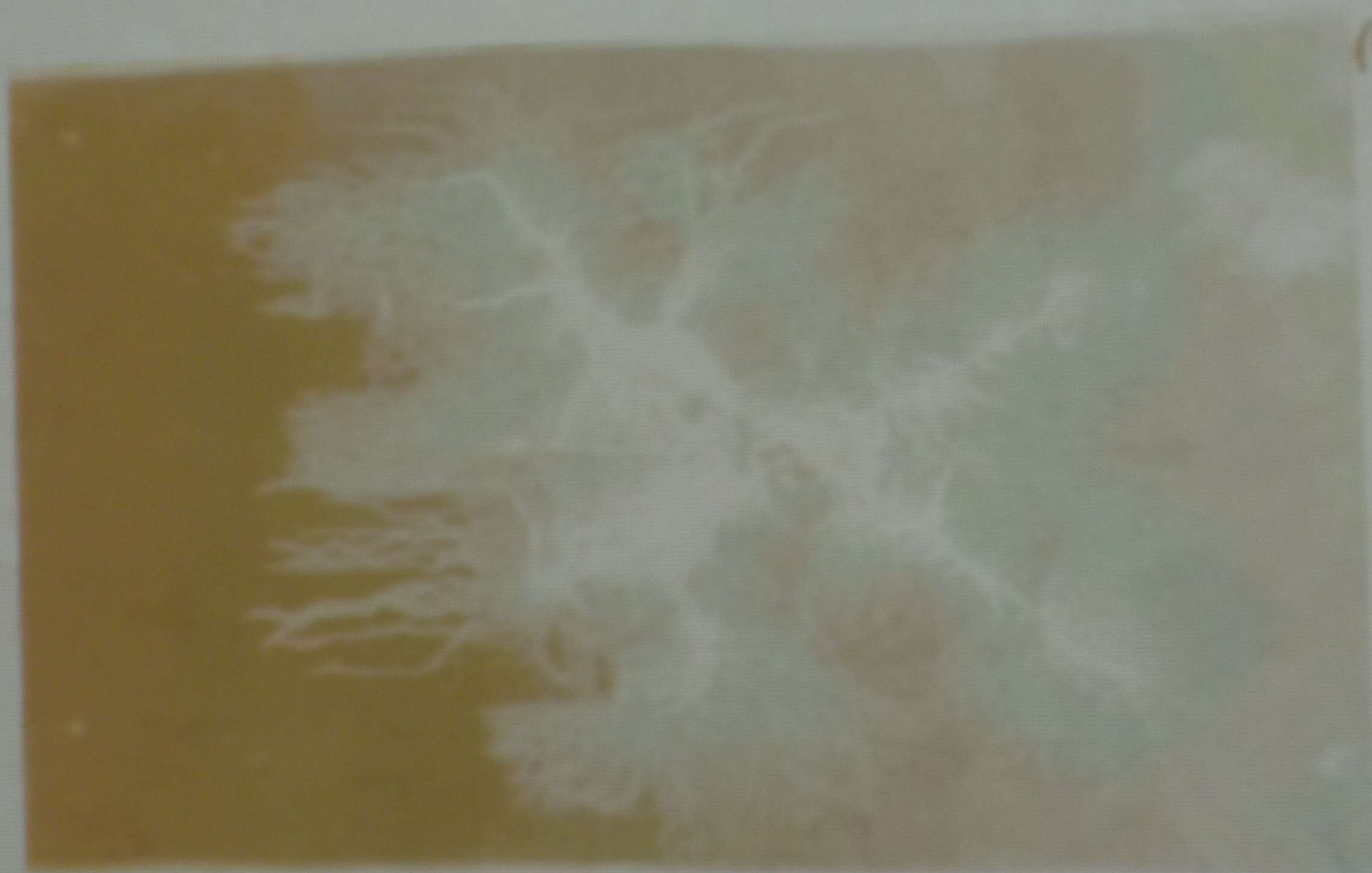




(Courtesy of [marinesurvey.com](http://marinesurvey.com))



and "quick-dry" paints are most susceptible to this. The presence of an adverse effect has been proven by field experience. When should exhibit low water vapor transmission characteristics and excels should also be considered for coating carbon steel because of the



(Courtesy of [www.cp.umi](http://www.cp.umi))

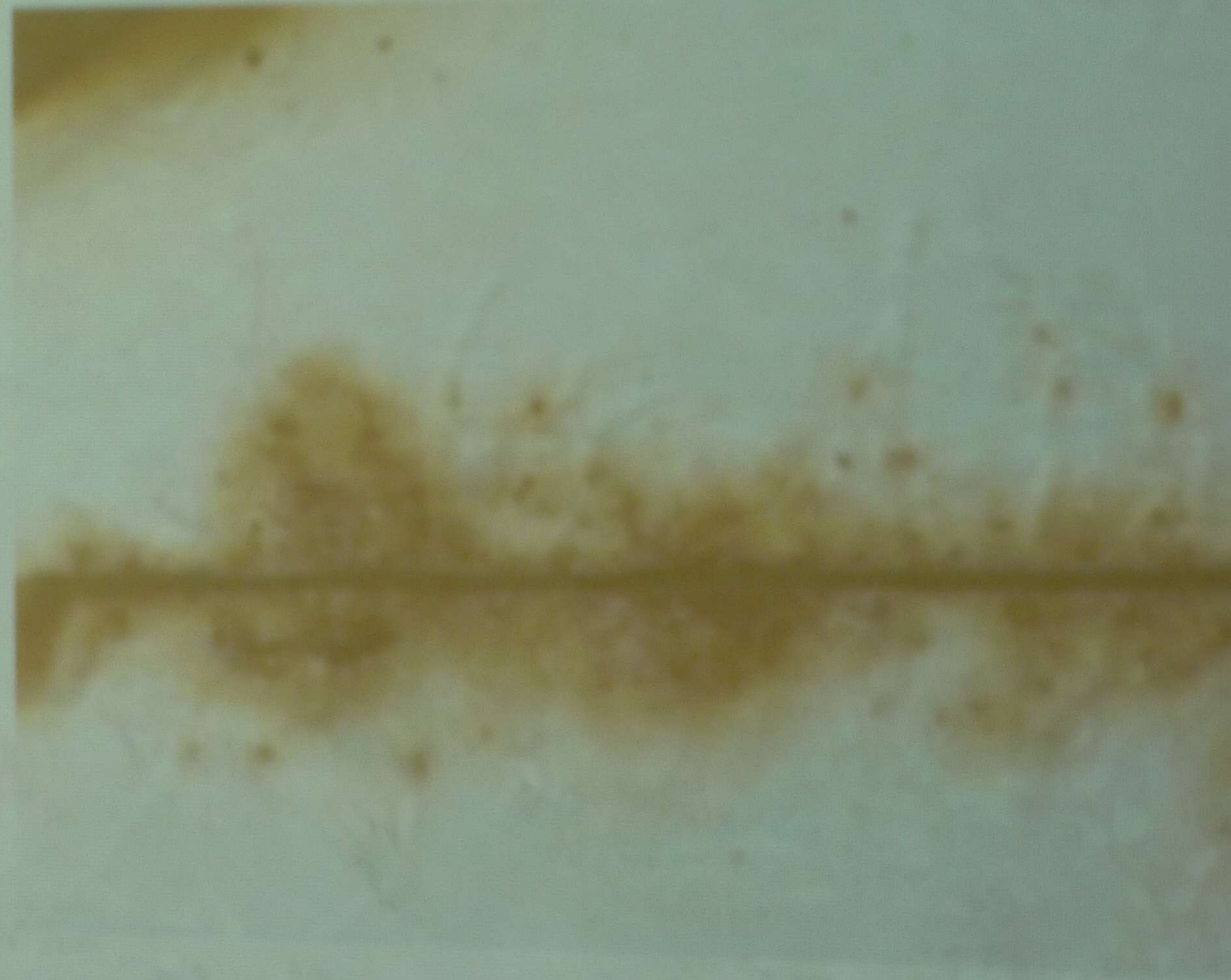


<http://v>

Corrosion normally starts at small, sometimes microscopic, defects in



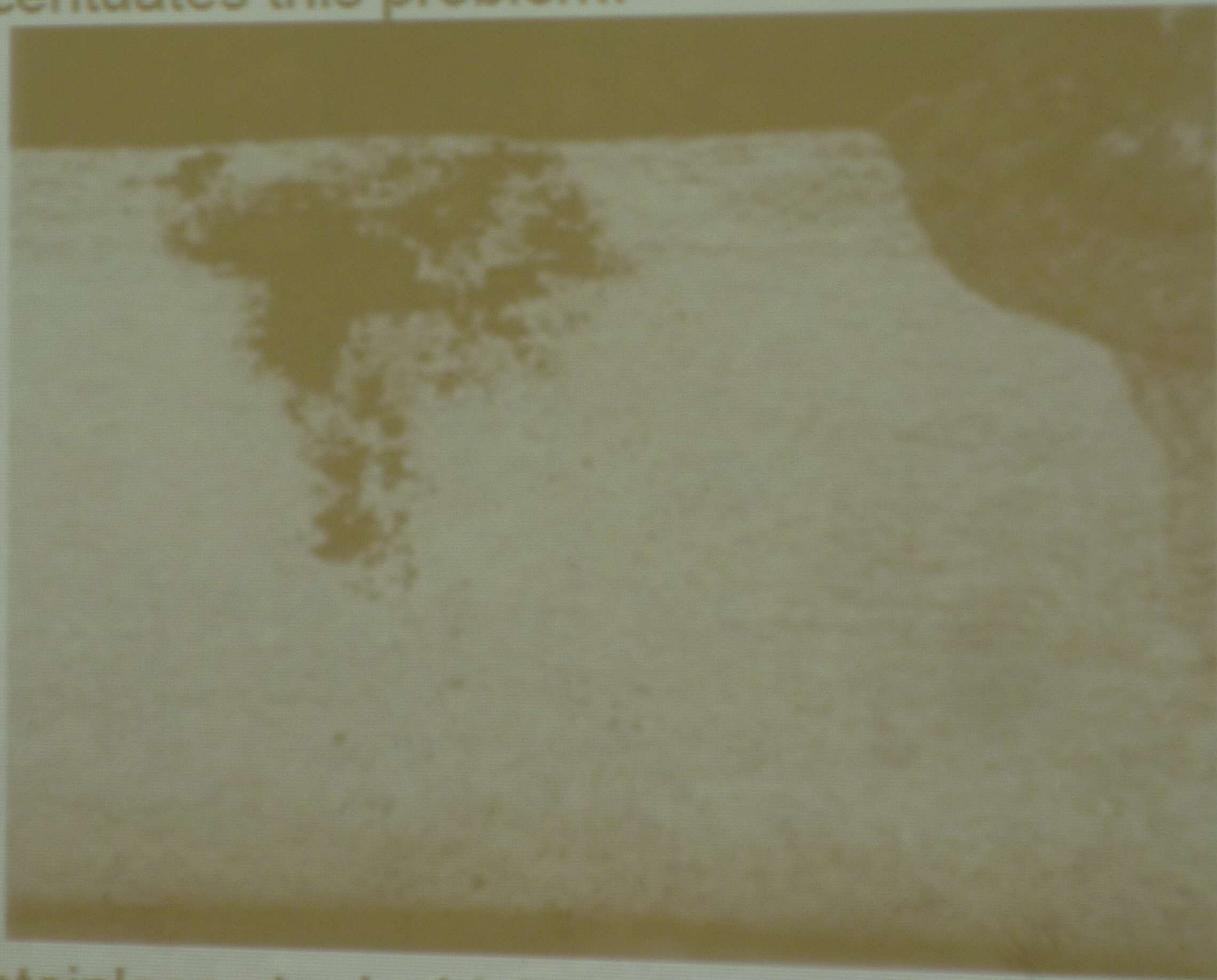
Corrosion normally starts at small, sometimes microscopic, defects in the coating.



On the left shows filiform corrosion causing bleed-through on a welded tank. The picture on the right shows "worm-like" filiform corrosion tunnels forming under a coating at the Atmosphere.



section of most commercial alloys will show its granular structure. quantities of individual grains, and each of these tiny grains has a cle ally differs from the metal within the grain center. Heat treatment of alloys accentuates this problem.



shows a stainless steel which corroded in the heat affected zone a s d. This is typical of intergranular corrosion in austenitic stainl



...is typical...  
...ed by using stabilized stainless steels (321 or 347) or by using...  
...316L).  
...um alloys (2000, 6000, and 7000 series alloys) can also have this pro...  
...ation corrosion below.



...f intergranular corrosion. It manifests itself by lifting up the surface o







# Beach Marks

Composite Fatigue of a Propeller

Photo Courtesy H. Hack, USNSRDC-Annapolis

