

# NANOTECHNOLOGIES: WONDERS AND UNCERTAINTIES IN THE UNIVERSE OF CHEMISTRY



MINISTÉRIO  
DO TRABALHO E EMPREGO



FUNDACENTRO  
FUNDAÇÃO JORGE DUPRAT FIGUEIREDO  
DE SEGURANÇA E MEDICINA DO TRABALHO



**NANOTECHNOLOGIES:  
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IN THE UNIVERSE OF CHEMISTRY**

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# **NANOTECHNOLOGIES: WONDERS AND UNCERTAINTIES IN THE UNIVERSE OF CHEMISTRY**

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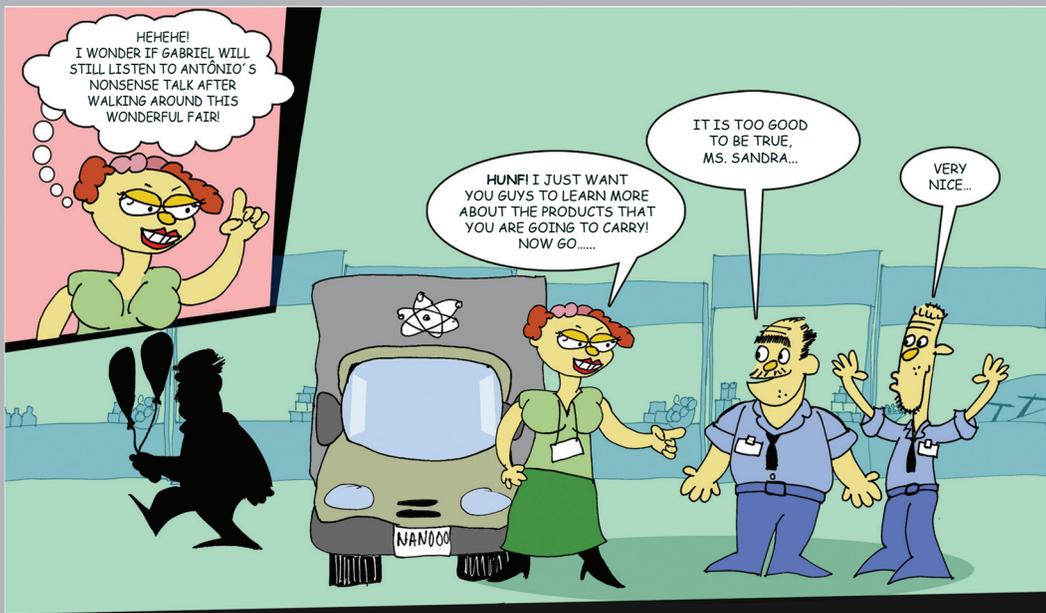
# NANOTECHNOLOGIES:

WONDERS AND UNCERTAINTIES IN THE CHEMISTRY UNIVERSE.



## NANOWONDERS





HEHEHE!  
I WONDER IF GABRIEL WILL  
STILL LISTEN TO ANTÔNIO'S  
NONSENSE TALK AFTER  
WALKING AROUND THIS  
WONDERFUL FAIR!

HUNFI I JUST WANT  
YOU GUYS TO LEARN MORE  
ABOUT THE PRODUCTS THAT  
YOU ARE GOING TO CARRY!  
NOW GO.....

IT IS TOO GOOD  
TO BE TRUE,  
MS. SANDRA...

VERY  
NICE...



RIGHT AFTER, AT THE FAIR...

BOY,  
WHEN MS. SANDRA  
ACTS THAT NICE... I  
GET GOOSE BUMPS!

REMEMBER  
LAST TIME SHE WAS  
THIS NICE? IT WAS RIGHT  
BEFORE SHE ASSIGNED US TO  
TAKE A FREIGHT  
ALL THE WAY ACROSS TO  
THE COUNTRY!



**PETROPLAST**  
PETROCHEMICAL  
COMPANY: PLASTIC  
INNOVATIONS

GOOD IDEA!  
FROM WHAT I'VE LEARNED  
AT THE UNION COURSE,  
NANOTECHNOLOGY CAN  
BRING GREAT INNOVATIONS  
TO PLASTIC  
PRODUCTION!

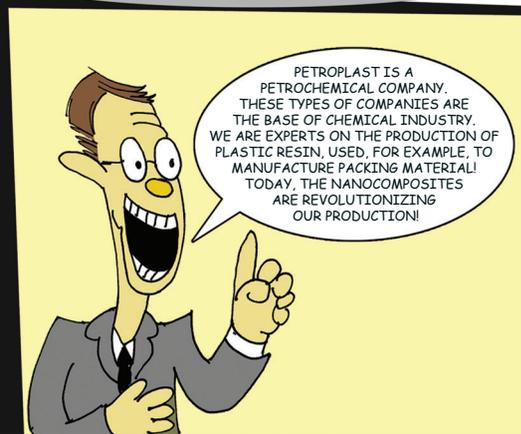
WHY DON'T  
WE START HERE,  
MR. ANTÔNIO?



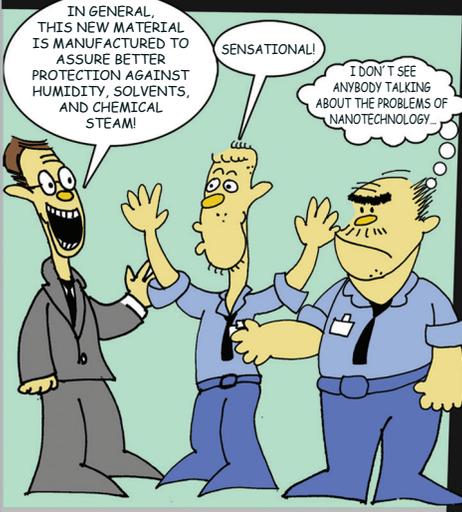
ARE YOU ENJOYING THE  
FAIR? GREAT PRODUCTS.  
HUH? WOULD YOU LIKE  
TO KNOW MORE ABOUT  
NANOTECHNOLOGY AND  
PLASTICS?

I BET THIS GUY  
DRINKS A LOT OF  
COFFEE...

WOW! TELL US  
ALL ABOUT IT!



PETROPLAST IS A  
PETROCHEMICAL COMPANY.  
THESE TYPES OF COMPANIES ARE  
THE BASE OF CHEMICAL INDUSTRY.  
WE ARE EXPERTS ON THE PRODUCTION OF  
PLASTIC RESIN, USED, FOR EXAMPLE, TO  
MANUFACTURE PACKING MATERIAL!  
TODAY, THE NANOCOMPOSITES  
ARE REVOLUTIONIZING  
OUR PRODUCTION!





NANOTECHNOLOGY ALLOWS US TO WORK WITH MATTER, FOR SCIENTIFIC OR INDUSTRIAL PURPOSES, AT NANOMETER SCALE! 1 NANOMETER IS THE SAME OF ONE METER BILLIONTH! A HAIR, FOR EXAMPLE, IS SOMETHING AROUND 50,000 AND 10,000 NANOMETERS!

1 METER (m)

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1.000.000.000

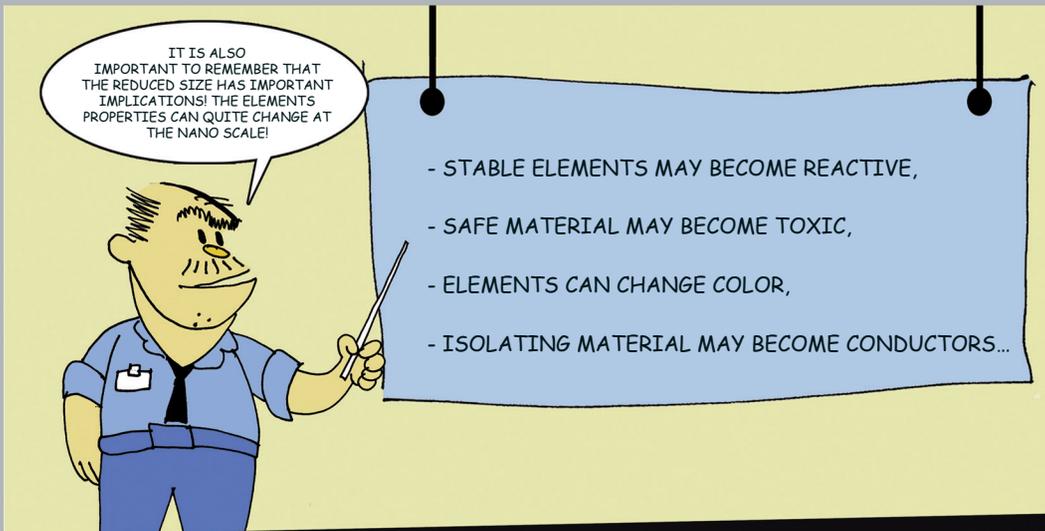
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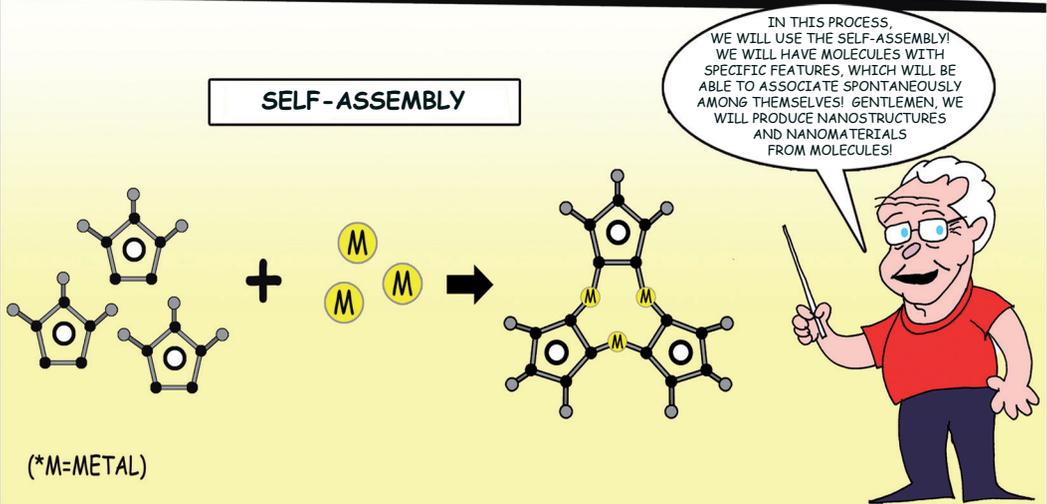
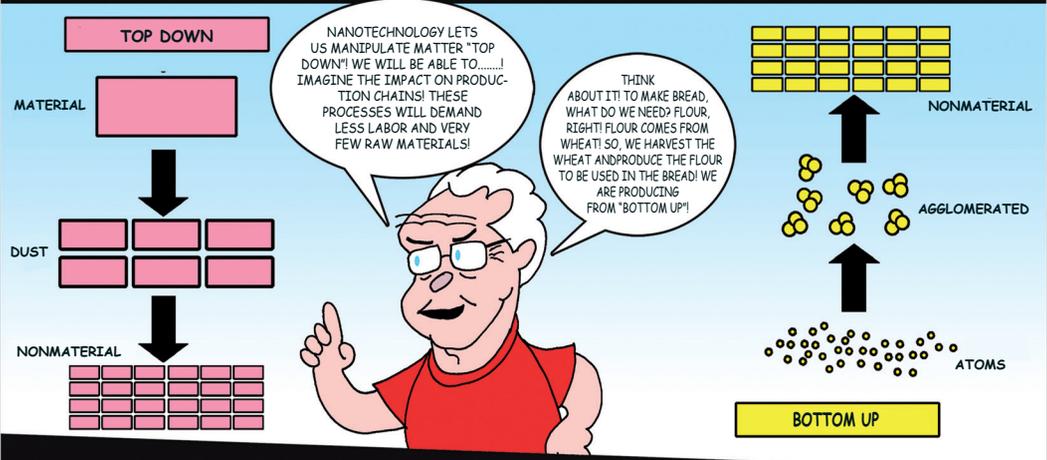
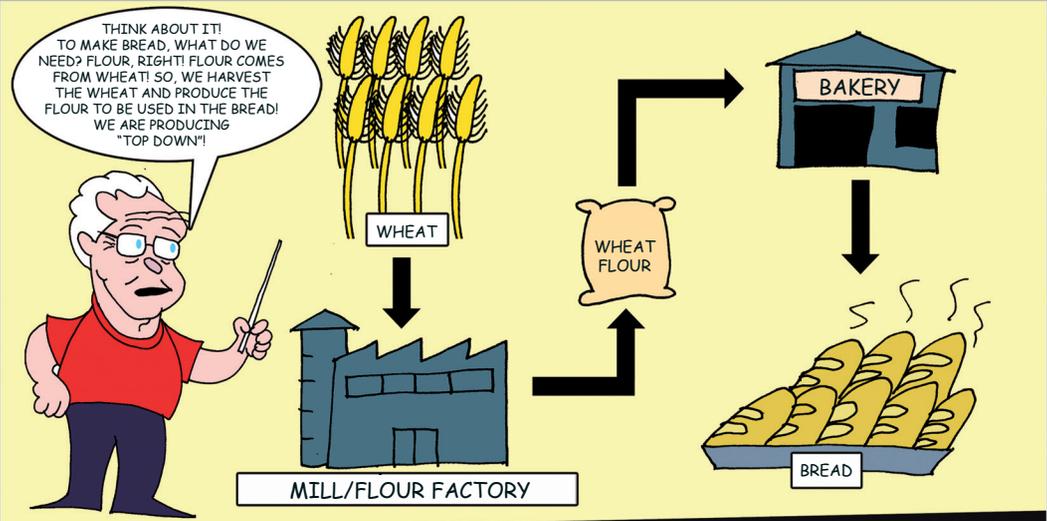
1 NANOMETER (nm)

HUMAN HAIR

←

BETWEEN 50,000 AND 100,000 NANOMETERS THICK







AT ANOTHER BOOTH...

# NANOINKS

CAR PAINTING

WE PAINT CARS USING WITH SCRATCH-RESISTANT PAINT MADE WITH NANOPARTICLES

THIS IS NICE, ISN'T IT MR. ANTONIO?

SURE, SURE... HEY INK MAN, DO YOU HAVE ANY STUDY ON SAFETY IN THE WORKPLACE TO THOSE THAT PRODUCE THIS INK? CAN THESE NANOPARTICLES BE TOXIC?

# NANOINKS

CAR PAINTING

STUDY? SAFETY I DON'T KNOW... IT SEEMS THAT THE GUYS OVER THE PLANT ARE CONCERNED ABOUT THIS... BUT I HAVE LOTS OF PENS, PAPERS, CUPS, AND BROCHURES! PLEASE TAKE THEM! THEY ARE OUR GIFTS FOR YOU!

YOU ARE TERRIBLE MR. ANTONIO...

INDEED I AM!

MR. ANTONIO STRIKES ONCE AGAIN...

# SHINY PLASTICS

WE MANUFACTURE "OLEDS"! THEY ARE USED IN SHINY PLASTICS! THEY ARE THIN PLATES OF A MATERIAL SIMILAR TO PLASTIC THAT EMIT LIGHT WHILE RECEIVING ELECTRIC ENERGY!

INCREDIBLE! PLASTICS THAT SHINE!

WHAT ARE OLEDS GOOD FOR?

THEY CAN BE FOUND IN THE DISPLAY OF DIGITAL CAMERAS AND CAMCORDERS! IN THE FUTURE, THEY WILL BE FOUND IN CELL PHONES AND PORTABLE COMPUTERS!

THAT'S INNOVATION!

I AM SURPRISED TOO!

# SHINE PLASTICS

THE PRODUCTION OF THIS NEW DISPLAY IS CHEAPER THAN LIQUID CRYSTAL SCREENS THAT WE CURRENTLY USE! THE OLEDS HAVE THEIR OWN LIGHT, WHICH RESULTS IN LOWER ENERGY CONSUMPTION!

MAN!

YEAH!

RIGHT... BUT DO YOU INVEST ON STUDIES ON HEALTH AND SAFETY OF WORKERS AND CONSUMERS? WHAT ABOUT THE DISPOSAL OF THIS MATERIAL OUT IN THE ENVIRONMENT?

OUCH... THIS IS THE GUY WHO IS ALWAYS ASKING ABOUT SAFETY AND HEALTH... SHALL WE GET SOME GIFTS?

# PLASTICS



# NEW UNIVERSE FREIGHT SERVICES



THE BEST TRAINED DRIVERS AND ASSISTANTS IN THE MARKET!

WE AGREED HALF AN HOUR ONLY GUYS! YOU GUYS HAVE LEFT MORE THAN ONE HOUR AGO! HOW DO YOU EXPLAIN THIS, HUH?

MS. SANDRA, THERE WERE PLENTY OF FANTASTIC NEWS!

IT WAS VERY IMPORTANT, MS. SANDRA. WE WOULDN'T LEARN MUCH ON NANOTECHNOLOGY STAYING HERE, RIGHT?



OK GUYS, YOU ARE RIGHT! I GUESS IT WAS VERY GOOD TO WALK AROUND THE FAIR.

WOW! IS SHE FEELING ALL RIGHT? SHE IS SO UNDERSTANDING!



I AM QUITE HAPPY GUYS! I JUST CLOSED A GREAT DEAL TO OUR COMPANY HERE AT THE FAIR! WE WILL CARRY NANOCOMPOSITES BETWEEN A PETROCHEMICAL COMPANY SPECIALIZED IN PLASTIN RESINS AND A PACKING FACTORY!



BECAUSE I LIKE YOU SO MUCH, MY COLLABORATORS, I HAVE DECIDED THAT YOU BOTH WILL DRIVE THE FIRST FREIGHT! UNDER MY SUPERVISION!

YEAH... HOW COOL...

BACK TO THE TRUCK, RIGHT, MS. SANDRA?

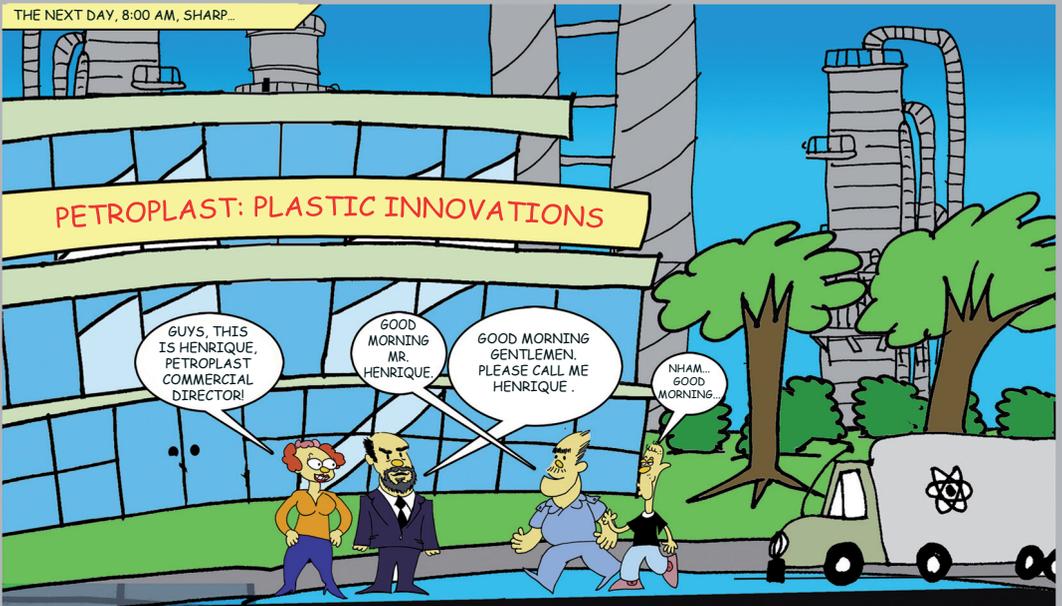


NO TRUCK FOR ME! I'LL TAKE A CAB! TAKE THE PETROCHEMICAL PLANT'S ADDRESS TO PICK THE NANOCOMPOSITES UP AND WE'LL MEET THERE TOMORROW. AT 8:00 AM! THEY WILL WALK US AROUND THE PLANT!

WHEW! SHE WILL TAKE A CAB!

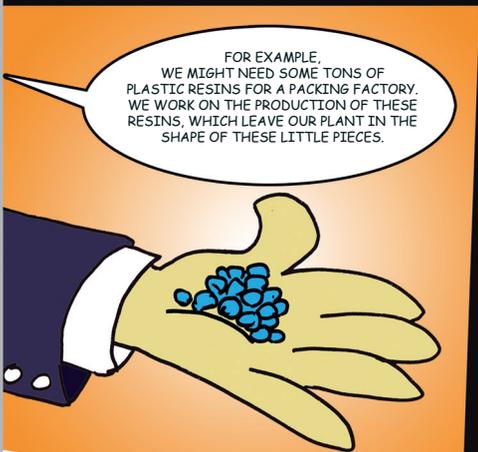


THE NEXT DAY, 8:00 AM, SHARP...

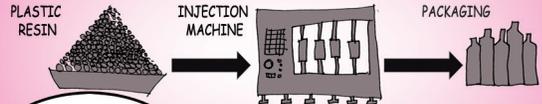
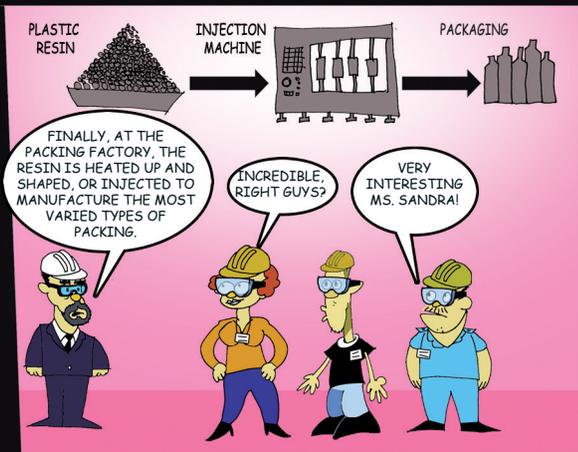




WOW, THIS PLACE IS HUGE!



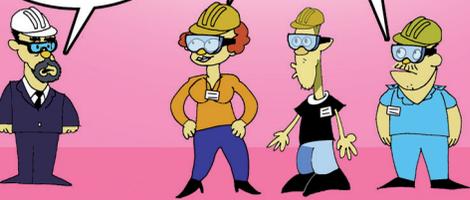
FOR EXAMPLE, WE MIGHT NEED SOME TONS OF PLASTIC RESINS FOR A PACKING FACTORY. WE WORK ON THE PRODUCTION OF THESE RESINS, WHICH LEAVE OUR PLANT IN THE SHAPE OF THESE LITTLE PIECES.

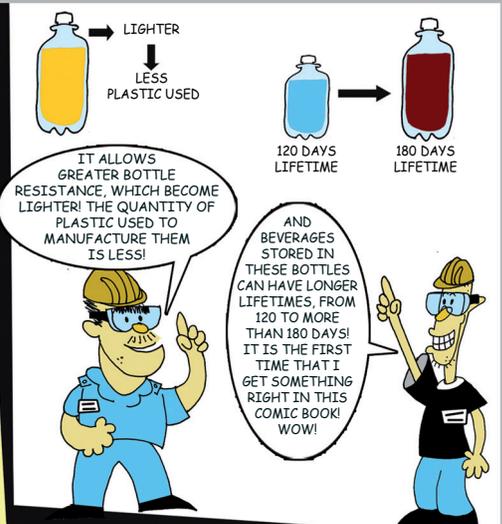


FINALLY, AT THE PACKING FACTORY, THE RESIN IS HEATED UP AND SHAPED, OR INJECTED TO MANUFACTURE THE MOST VARIED TYPES OF PACKING.

INCREDIBLE, RIGHT GUYS?

VERY INTERESTING MS. SANDRA!







THIS IS OLGA, A CIPA MEMBER, INSIDE PETROPLAST. OLGA, THEY REPRESENT NEW UNIVERSE FREIGHT SERVICES. SANDRA, ANTÔNIO AND GABRIEL.

HELLO. YOU MUST BE AS SMART AS MR. ANTÔNIO...

SHE IS MUCH MORE!

HOW DOES YOUR CIPA WORK?



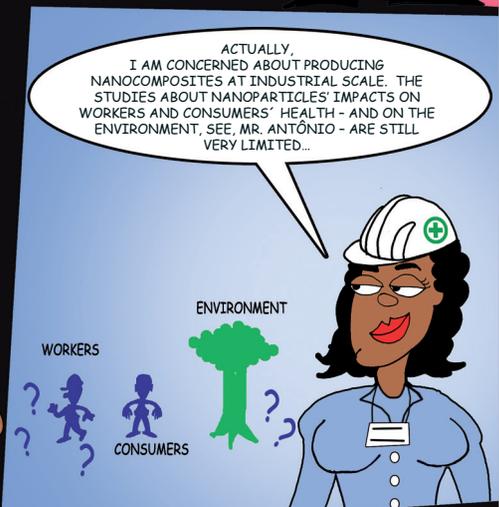
OUR INTERNAL COMMISSION ON ACCIDENT'S PREVENTION IS LIKE YOURS, AT THE FREIGHT SERVICES. ACCORDING TO THE REGULATING RULE # 5, IT IS COMPOSED BY EMPLOYEES, AND PERFORMS ACTIVITIES TO ASSURE HEALTH AND SAFETY IN THE WORKPLACE, ACCORDING TO THE LEGISLATION FROM THE MINISTRY OF LABOR...



AND DON'T FORGET THAT THE ENVIRONMENT SHOULD ALSO BE A CIPA CONCERN, RIGHT OLGA?

CIPA IS IMPORTANT... BUT IT IS A MUST TO WORK IN A NANOTECHNOLOGY COMPANY, RIGHT?

ISN'T IT MRS. OLGA?



ACTUALLY, I AM CONCERNED ABOUT PRODUCING NANOCOMPOSITES AT INDUSTRIAL SCALE. THE STUDIES ABOUT NANOPARTICLES' IMPACTS ON WORKERS AND CONSUMERS' HEALTH - AND ON THE ENVIRONMENT, SEE, MR. ANTÔNIO - ARE STILL VERY LIMITED...



NOW IT IS CLEAR WHERE MR. ANTÔNIO'S PESSIMISM COMES FROM...

OH NO... HERE WE GO...

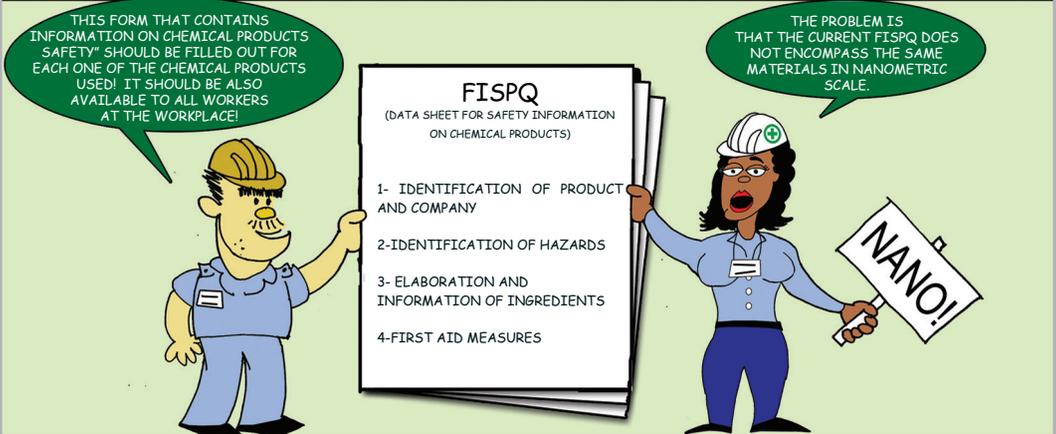
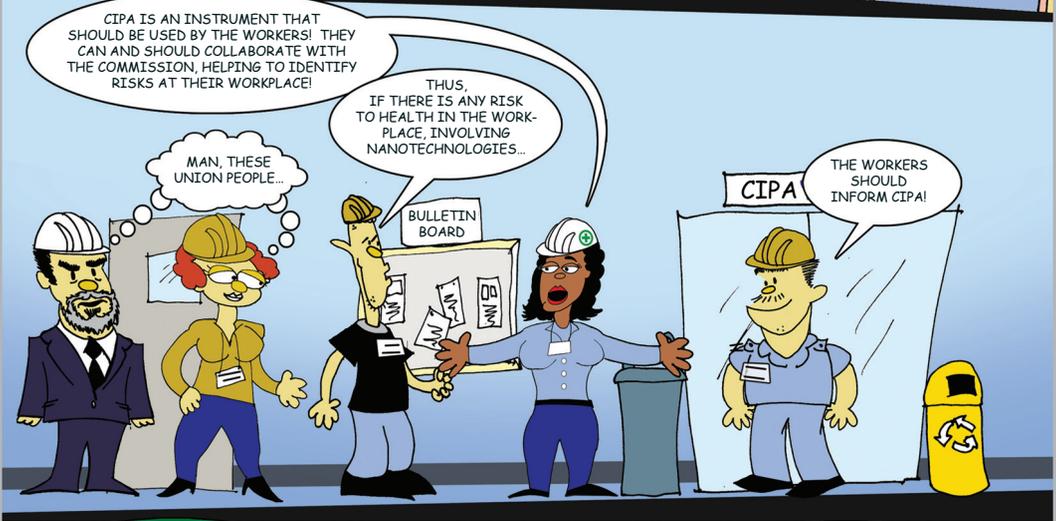
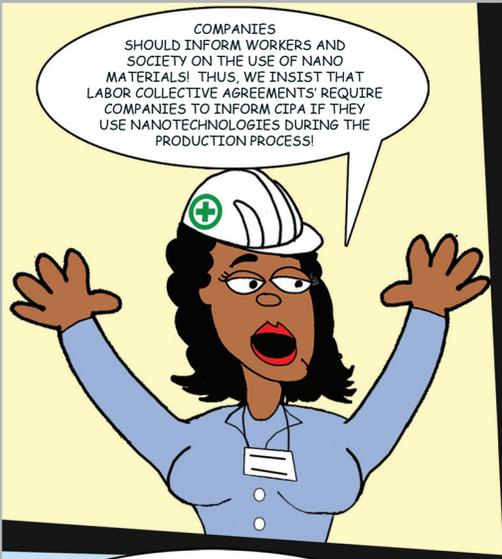
MAN! NOW MS. SANDRA IS GOING TO HEAR SOME!

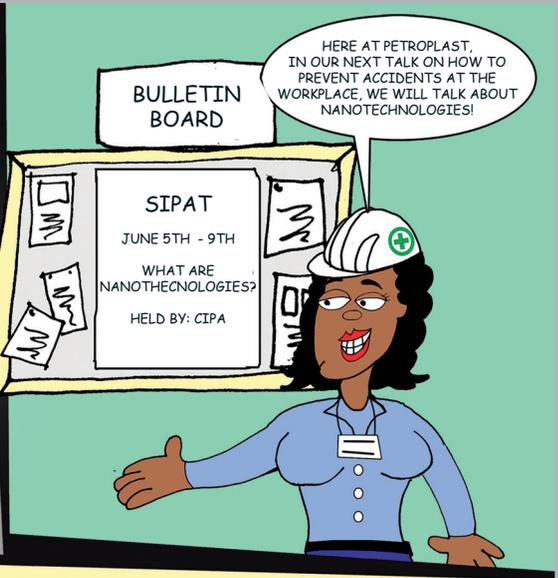
PESSIMISM? TELL US A LITTLE MORE ABOUT IT, OLGA!

BULB BOARD

CIPA OFFICE







THIS COMIC IS THE RESULT OF THE PROJECT "IMPACT OF NANOTECHNOLOGY ON HEALTH OF WORKERS AND ENVIRONMENT", WHICH STARTED IN 2007 AT FUNDACENTRO. THIS PROJECT WAS MADE IN PARTNERSHIP WITH RENANOSOMA (RESEARCH NETWORK FOR NANOTECHNOLOGY, SOCIETY AND ENVIRONMENT), DIEESE (INTER-UNION DEPARTMENT FOR STATISTICS AND SOCIAL-ECONOMIC STUDIES), DIESAT (INTER-UNION FOR RESEARCH AND STUDIES OF HEALTH AND WORKPLACE), IIEP (EXCHANGE, INFORMATION, RESEARCH AND STUDIES), UNION OF ABC REGION CHEMISTS, OSASCO METALWORKERS' UNION, INSTITUTO OBSERVATÓRIO SOCIAL,, ENSP / FIOCRUZ (NATIONAL SCHOOL FOR PUBLIC HEALTH / OSWALDO CRUZ FOUNDATION) AND CEREST / SP (REFERENCE CENTER FOR WORKER HEALTH IN THE STATE OF SÃO PAULO).

THIS COMIC BOOK WAS DEVELOPED BY THOMAZ FERREIRA JENSEN E AND ANTONIO GRACIAS VIEIRA FILHO, WHO DRAFTED THE SCREENPLAY AND THE SCRIPT IN DIALOGUE WITH THE PROJECT TEAM "IMPACTS OF NANOTECHNOLOGY ON WORKERS HEALTH AND ENVIRONMENT ". THE IDEA OF USING A CARRIER COMPANY IN ALL THE STORIES OF SERIES WAS FROM ALEXANDRE CUSTÓDIO PINTO AND THE CARRIER CHARACTERS WERE CREATED BY JOÃO ANTONIO GARCIA, KNOWN AS "JÃO GARCIA".

OTHER TEXTS ON THE SUBJECT CAN BE FOUND AT:

- [HTTP://WWW.FUNDACENTRO.GOV.BR/INDEX.ASP?D=NANO](http://www.fundacentro.gov.br/index.asp?D=NANO)
- [HTTP://BLOG.IIEP.ORG.BR/NANOTECNOLOGIA](http://blog.iiep.org.br/nanotecnologia)
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