

INNOVATIVE RADIATION STRATEGIES IN MICRO/NANOPLASTIC REMEDIATION

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MINISTÉRIO DA
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Brazilian Nuclear Energy Commission



Brazilian Nuclear Energy Commission

Nuclear Engineering Institute

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Research on progress:

1- Radioactive nanoparticles

2- Hydrogen production

3- Micro/nanoplastics treatment by radiation



GLASS MICROSPHERES DOPED WITH HOLMIUM-166 FOR CANCER



100% PRODUCED IN BRAZIL



LOW COST



ECO-FRIENDLY SYNTHESIS – RECYCLED GLASS

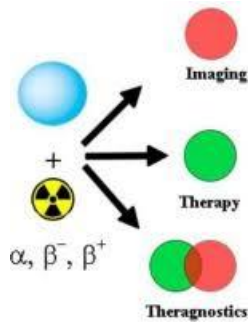


CLINICAL TRIAL IN PROGRESS

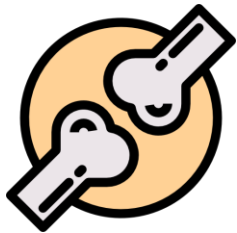




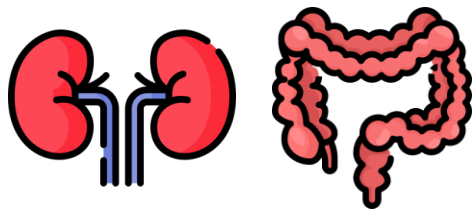
GRAPHENE QUANTUM DOTS WITH RADIUM-223



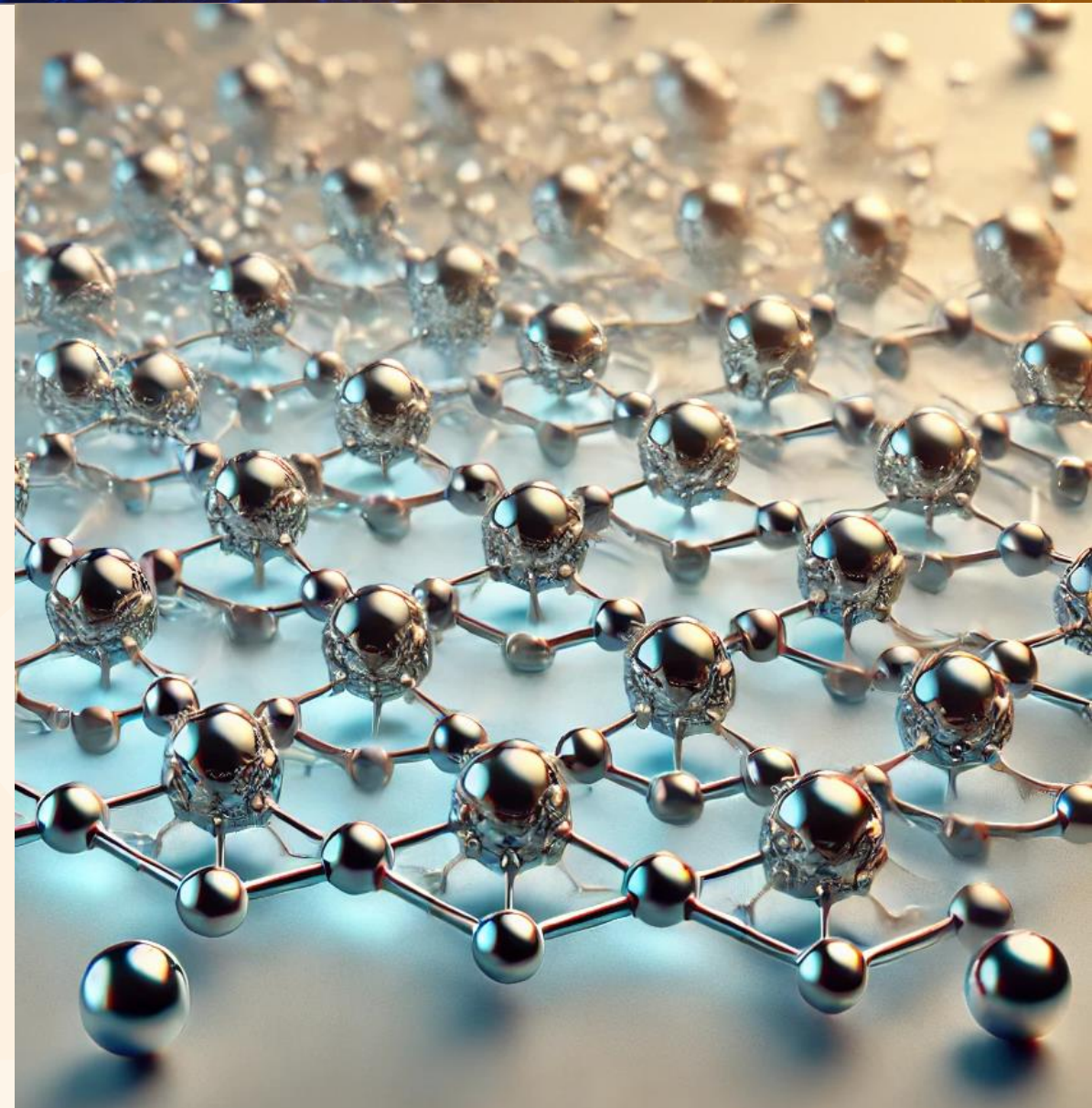
EASY AND CHEAP TO OBTAIN



VERY EFFECTIVE AGAINST OSTEOSARCOMA

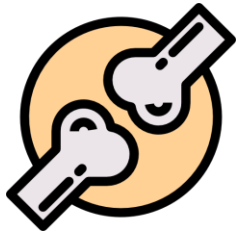


RENAL EXCRETION AND FECAL
EXCRETION





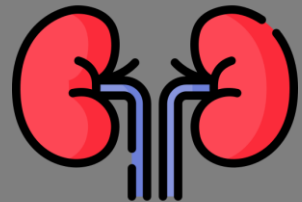
RADIUM-223 NANOMICELLE FOR OSTEOSARCOMA



VERY EFFECTIVE AGAINST OSTEOSARCOMA



EASY SYNTHESIS

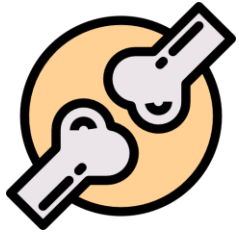


COMPLETE RENAL EXCRETION





RADIUM-223 NANO-HYDROXYAPATITE



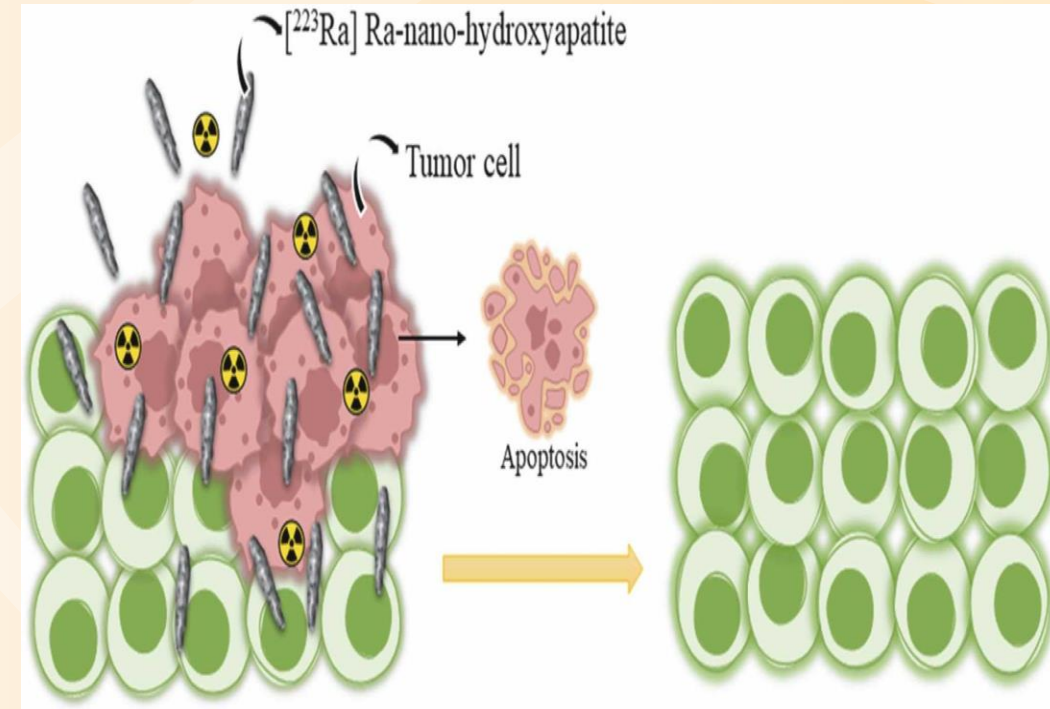
VERY EFFECTIVE AGAINST OSTEOSARCOMA



EASY SYNTHESIS



CHEAP AND EFFICIENT





HYDROGEN FORMATION



BY GAMMA AND NEUTRON RADIATION

GENERATE GREEN FUEL HYDROGEN





INNOVATIVE RADIATION STRATEGIES IN MICRO/NANOPLASTIC REMEDICATION



Nano/Microplastics

Nanoplastic are plastic particles with one or more external dimensions in the size of 1–100 nm. Microplastic has been defined as plastic particles between 0.1 and 5000 μm



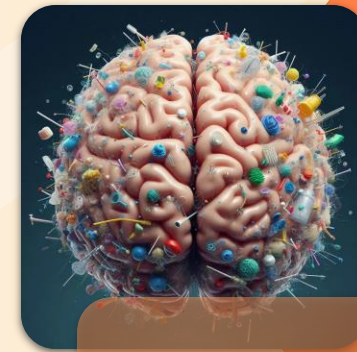
Microplastics



Accumulation
in soils



Transfer
through the
food chain



Health
impacts

Chronic inflammatory
responses

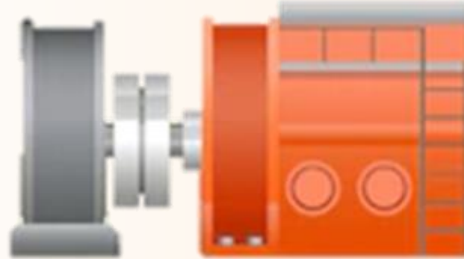
Carcinogenic effects

Endocrine disruptors,
interfering with fertility

Chronic
neuroinflammation:
Alzheimer's,
Parkinson's and ALS.



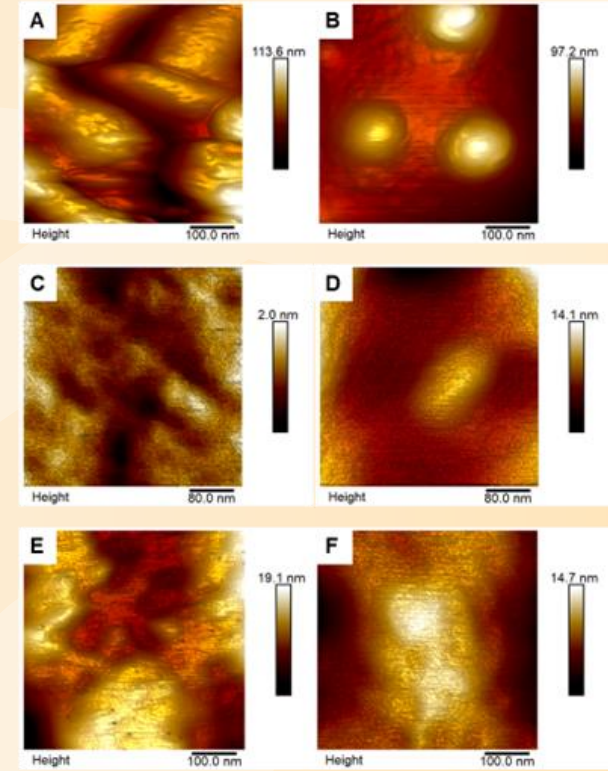
Nuclear Reactor

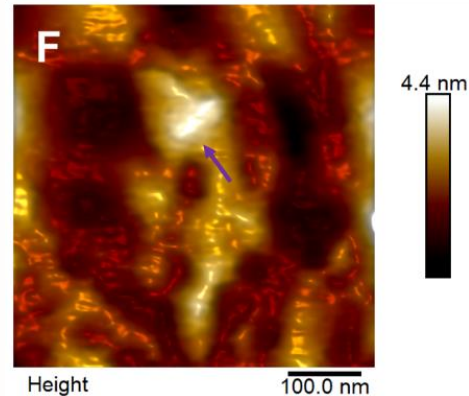
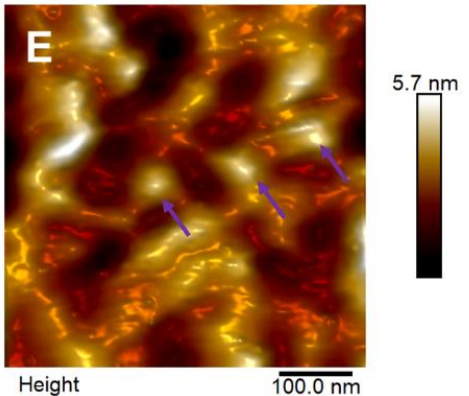
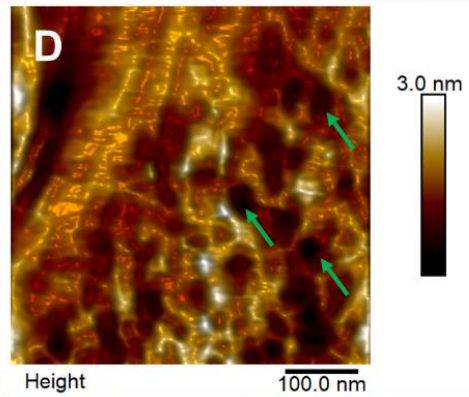
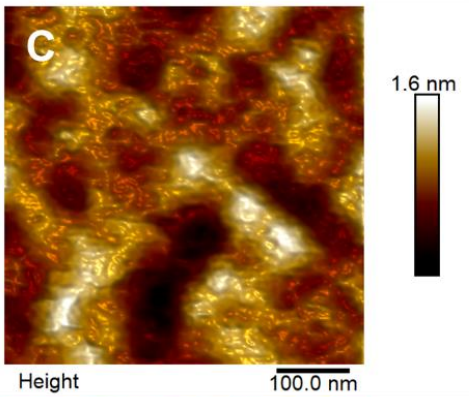
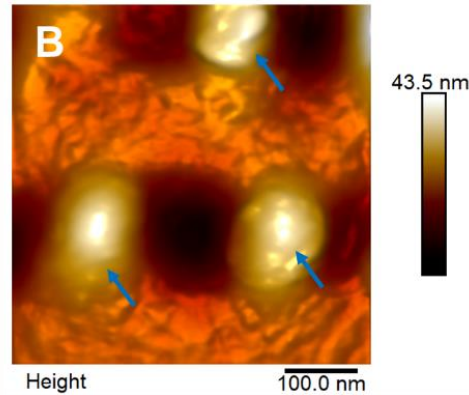
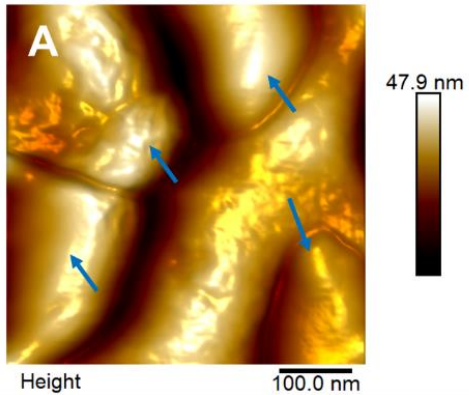


Neutrons source



REACTOR
IRRADIATION





PLGA

ULTRASTRUCTURAL ANALYSIS BY ATOMIC FORCE MICROSCOPY

Non-irradiated and irradiated nanoparticles

PCL

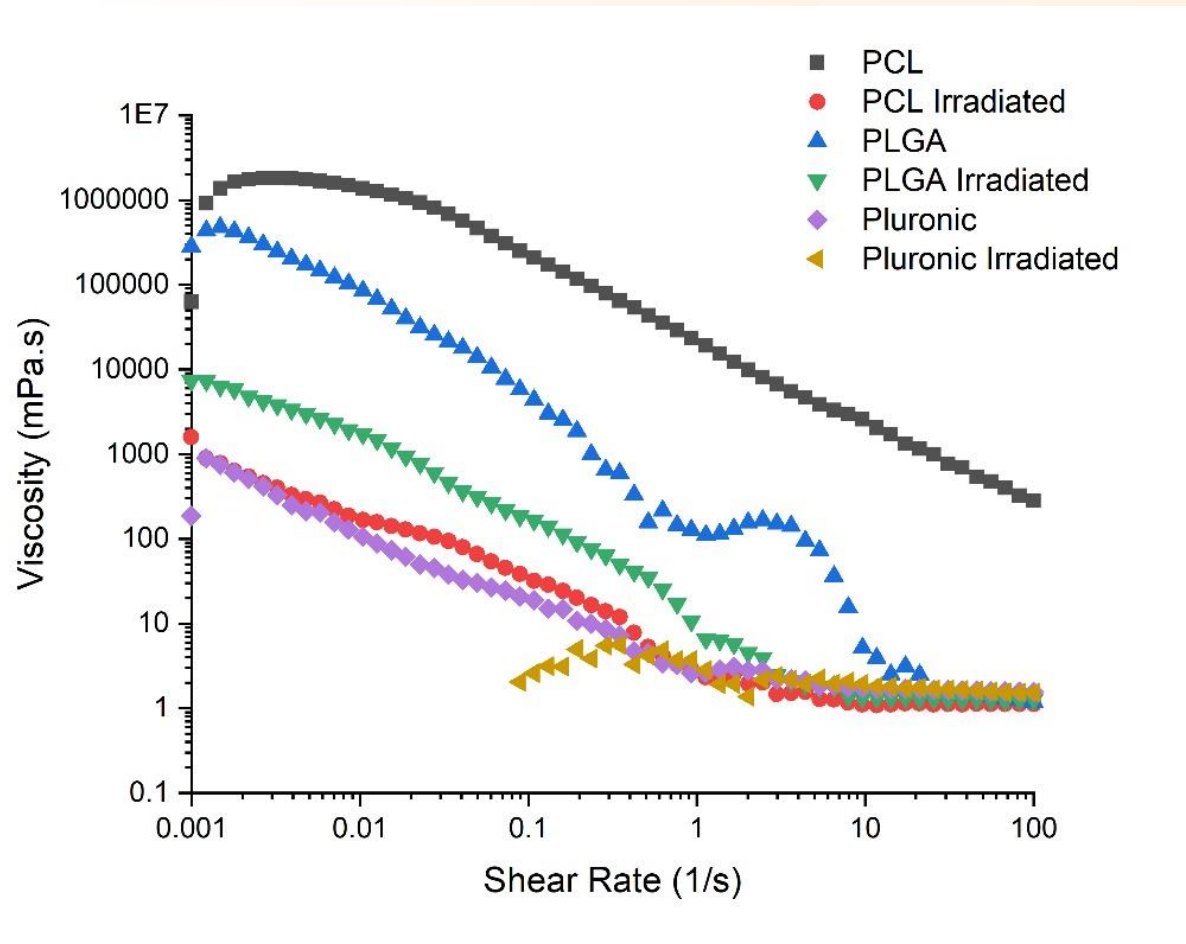
Pluronic

AFM analysis showed the morphological changes in the nanosystem films due to neutron irradiation



RHEOLOGICAL BEHAVIOR OF POLYMERIC NANOPARTICLES

Viscosity curves for polymeric samples before and after neutron irradiation.



We can see that they all exhibit shear dilution behavior; there is a decrease in apparent viscosity as the strain rate increases.



Partners in progress





Partners in progress

Grendene – biggest shoe producer in Brazil

Shoe sole with GQDs

CO₂ – capture

Antimicrobial – reduced bad odor

Increased durability – 30%



Grendene®





Partners in progress

Insider – Fabric of technological clothes in Brazil

Invisible nanoparticles – adaptative for any color

CO₂ – capture

Antimicrobial – reduced bad odor

Resistant fiber



INSIDER





Partners in progress

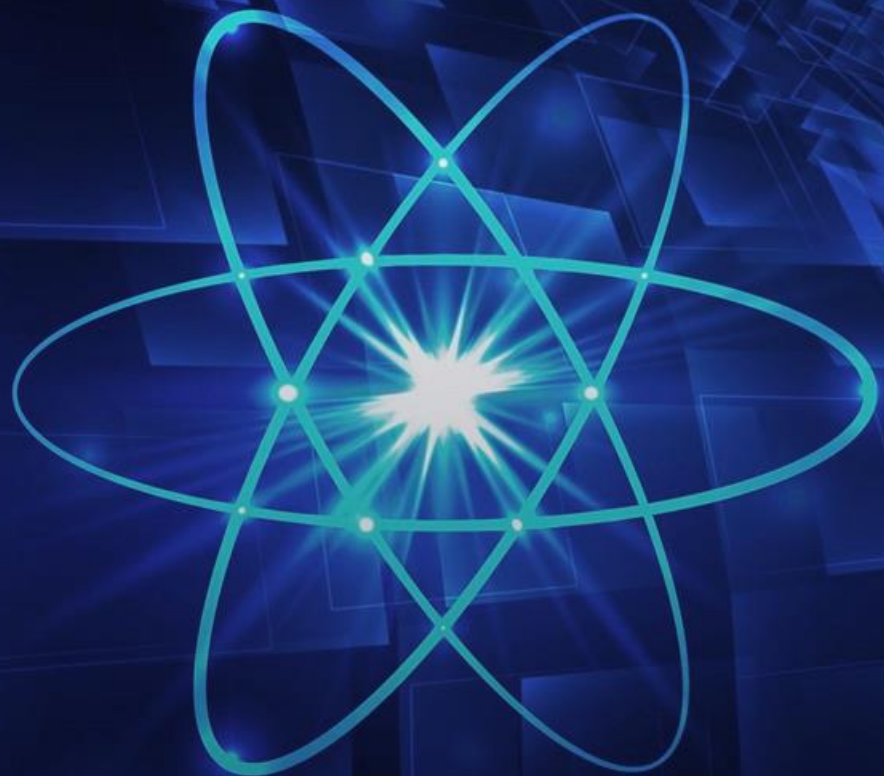
CBPF – Public-Public partnership

Hydroxyapatite radiolabeled with ^{223}Ra

Radiosynoviorthesis

Clinical Trial





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