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Development of methodologies for decontamination, reuse and improvement of the properties of respiratory protective equipment using ionizing radiation – preliminary results

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The logo for IPEN (Instituto de Pesquisas Energéticas e Nucleares), featuring a stylized graphic of a particle detector or similar scientific instrument above the lowercase text "ipen".

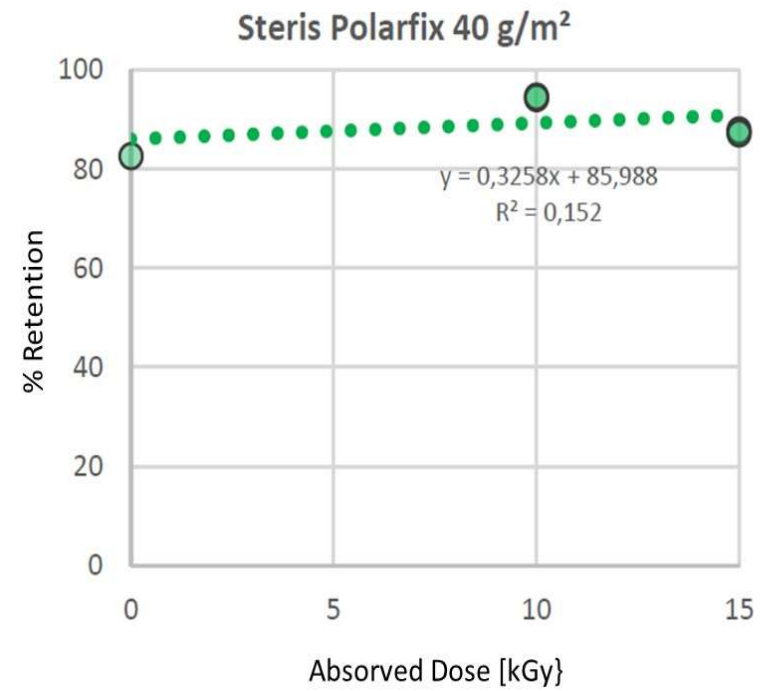
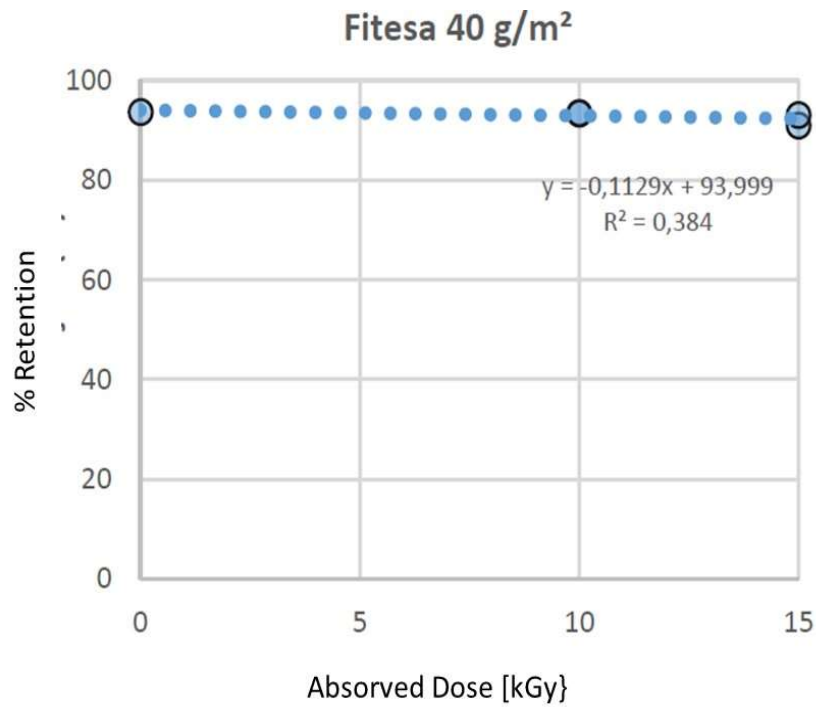
• What is the main purpose of irradiation (sanitisation for non-controlled hand-manufacturing environment)



- In the pandemic scenario **amid shortages of personal protective equipment (PPE)**, Brazilian non-governmental organizations, foundations, private initiative and volunteers, **created social inclusion projects** where seamstresses, informal professionals and prisoners began to make hand-manufactured masks using mainly **cloth / textile (e.g. cotton)** and **polypropylene nonwoven fabric (surgical PP)**. Some of the masks are donated to needy communities in the country others are destined for essential professionals (hospitals, police, army).
- However, **a) non-controlled hand-manufacturing environment**, different from clean industrial processes, can induce biological contamination in the produced masks and **b) from previous experience**, users from poor communities are **not expected to wash the cloth masks before use**.
- In this sense, **gamma irradiated PPE (cloth/textile and nonwoven PP)** was studied and characterized mainly to ensure the **filtration efficiency remained stable** and processing conditions have been established.
- Results shown that gamma irradiation guarantees the hand-manufactured masks are **totally sanitized (disinfected)** and offers **safe conditions for use** the PPE without leaving chemical toxic residues. It is important to note that in **these materials there are no electrostatic processes**.



Nonwoven PP filtration efficiency tests



• Which institutions are involved in this solidarity project? (agreements)



- **Nuclear and Energy Research Institute – IPEN** (Gamma Irradiation and characterization - analytical techniques)

<https://www.ipen.br/>

- **Technological Research Institute – IPT** (characterization -analytical techniques)
- **INOVA-USP - University of São Paulo –USP** (hand-manufacturing nonwoven PP masks “Respire” project - characterization)

<https://inova.usp.br/respire>

- **Paraisópolis Residents Union – “União dos Moradores e do Comércio da comunidade de Paraisópolis” Sewing dreams – “Costurando sonhos”** -(hand-manufacturing cloth / textile masks project)

<https://pt-br.facebook.com/UniaoParaisopolis/>

- **Alfaiataria de Negócios, Consultoria em Marketing e Planejamento /Plan International Brasil** – Sylvia Facciolla (hand-manufacturing cloth / textile masks project)

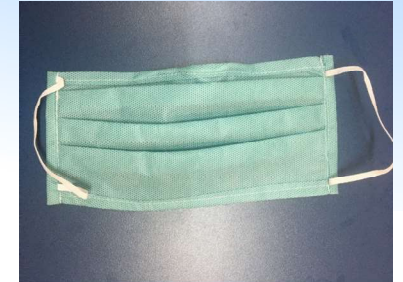
<https://plan.org.br/>

- **“Prof. Dr. Manoel Pedro Pimentel” Foundation – FUNAP** (hand-manufacturing nonwoven PP masks project)

<http://www.funap.sp.gov.br/site/index.php/noticia/274>



- **Please discuss the number of masks manufactured and treated (from the Cooperative and penitentiary)**



There are four main projects in which irradiation is being applied:

1. **INOVA-USP - University of São Paulo –USP**

- (i) create a **production model by low-income professionals** (seamstresses) “*Tecido Social*”,
- (ii) the use of techniques to characterize the materials used for their approval,
- (iii) a campaign for the responsible use of PPE for health professionals.
- (iv) emergency supply and temporary service for thee two hospitals connected to USP (*Hospital das Clínicas -HC* and *Hospital Universitário-HU*).

Production to the end of July / 2020, a **total of up to 01 (one) million surgical masks (nonwoven PP) for related hospitals**. Irradiated batch sets can reach between **50,000 to 100,000 masks / week**.



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Innovation Center

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2. Paraisópolis Residents Union -“*União dos Moradores e do Comércio da comunidade de Paraisópolis*” (hand-manufacturing cloth / textile masks “*Costurando Sonhos*” project)



- “**Costurando Sonhos**” - **Seamstresses** from needy communities.
- Estimated total production around **01 (one) million of cloth /textile masks**
- Donation to needy community
- Irradiated batch sets can reach between **15,000 masks / week**

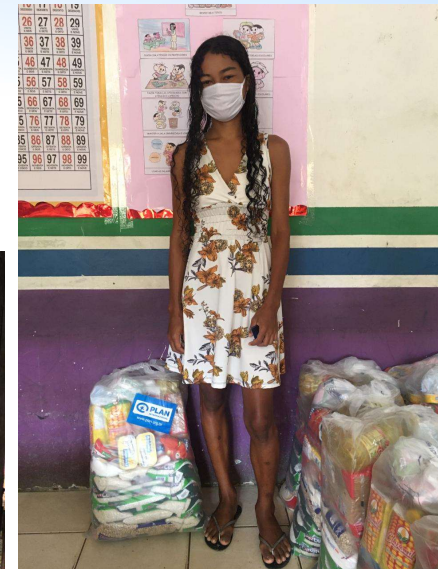


2. Paraisópolis Residents Union - “*União dos Moradores e do Comércio da comunidade de Paraisópolis*” (hand-manufacturing cloth / textile masks “*Costurando Sonhos*” project)



3. Alfaiataria de Negócios, Consultoria em Marketing e Planejamento /Plan International Brasil – Ms. Sylvia Facciolla (hand-manufacturing cloth / textile masks project)

- Seamstresses, informal professionals, donations, volunteers, etc.
- Production and irradiation is around **15,000** cloth /textile masks per week.
- Donation for needy community



3. Alfaiataria de Negócios, Consultoria em Marketing e Planejamento /Plan International Brasil – Ms. Sylvia Facciolla (hand-manufacturing cloth / textile masks project)



4. “Prof. Dr. Manoel Pedro Pimentel” Foundation – FUNAP (hand-manufacturing nonwoven PP masks project)

- FUNAP works for the **inclusion and social reintegration of prisoners**, developing their potential as individuals, citizens and professionals.
- Masks manufactured by the national penitentiary system. Every three days worked, inmates have a day of pardon. They also receive re-socialization scholarship equivalent to 3/4 of a minimum wage.
- **Masks for professionals considered essential** (hospitals, police, military etc.)
- Irradiated batch sets can reach **30,000 masks / week**



• Please describe the safety measures in your irradiation facility

- Irradiation facilities in Brazil are controlled by the **National Nuclear Energy Commission -CNEN**.
- Safety and Security standards are strictly applied at **Multipurpose Gamma Irradiation Facility**
- The use of **respiratory masks is mandatory** throughout the work period for both operators and visitors/users.
- Materials are handled with **protective clothes and gloves** and a **quarantine period** (if possible) is used before handling.
- If possible, an **70% ethanol spray is applied** on the surface of boxes containing the material before irradiation process.
- Distance is kept constantly.



IPEN/CNEN – São Paulo /SP
Capacity: 1000kCi

