Biofertilizer production in small-scale industry: the experience of Menagesha Biotech Industry PLC.

By

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Introduction:

•The word **Biofertilizer** is denoted to the means of nutrient supply through the biological agents.

•Most of the **Biofertilizers** are used for providing Nitrogen as nutrient;

• Nitrogen (N) is a nutrient that most frequently limits agricultural production.

•Global agriculture now relies heavily on large scale industrial nitrogen fixation- the N fertilizers that fueled the green revolution.

•The global increase in the use of N fertilizers parallels with the population growth,

Introduction continue……

- Agriculture now consumes over 80 million metric tons of N fertilizers per annum
- As a result, further increase in the need of N inputs will be necessary and inevitable.

- Nitrogen fertilizers are petroleum-based products, vulnerable to political and economic fluctuations in the oil markets.

- They are expensive inputs, costing agriculture more than $45 billion (US) per year (World Bank, 1990).

- At the farm level in Ethiopia, fertilizers are often too costly that the Government is forced to give on credit terms or unavailable due to lack of infrastructure and bulk requirements.

- Environmental costs are also high. Crops use fertilizer N inefficiently and generally do not assimilate 50% of the N fertilizer applied.

Introduction continue……

•The remainder is a potential source of environmental pollution , as it precipitates down to the soil profile or gets eroded via wind or running water.

•Furthermore, many cropping systems have reached the point of diminishing returns to fertilizer N applications, and

• There is a decline in global cereal production per unit of N fertilizers application .

• On the other hand Biological Nitrogen Fixation is correcting this trend and brings more than 60% N on the farm land.

• This is done with the symbiosis of legume crops and Rhizobia

Uses of pulse crops

•Food grain legumes are very important crops of the country

•They are exclusively important source of dietary protein and rank second as food after cereals and occupy more that 18% of the total cultivated areas, contributing about 12% of the total production (CSA, 2005 E.C)

•Pulse crops, an essential part of the dietary requirement for most Ethiopians, are grown mostly by small holding private farmers under rain fed conditions.

•They contribute about 8% to total daily calorie intake of the Ethiopian diet against 63% of cereals and about 17% of potatoes and other tubers.

•On the other hand, the animal products contribute only 1.9% of the total daily calorie intake.

•In developed countries, the contribution of cereals to the daily calorie intake is 20% while that of pulses and nuts is about 2.3% against 29.1% of animal products (FAO, 1996).

Uses of Biofertilizers on pulse crops.

•Pulse crops are grown on marginal lands for improving the land

• Hence are not as widely grown as cereals in the country in terms of area production.

•All or majority of the farmers cultivating pulse crops do not use chemical fertilizers.

•Improving the yields of these crops is improving the feeding quality of the population

•Biofertilizers supply up to 80% of the N requirements of these crop and improve the land fertility and provide 30% N requirement of the succeeding cereal crops

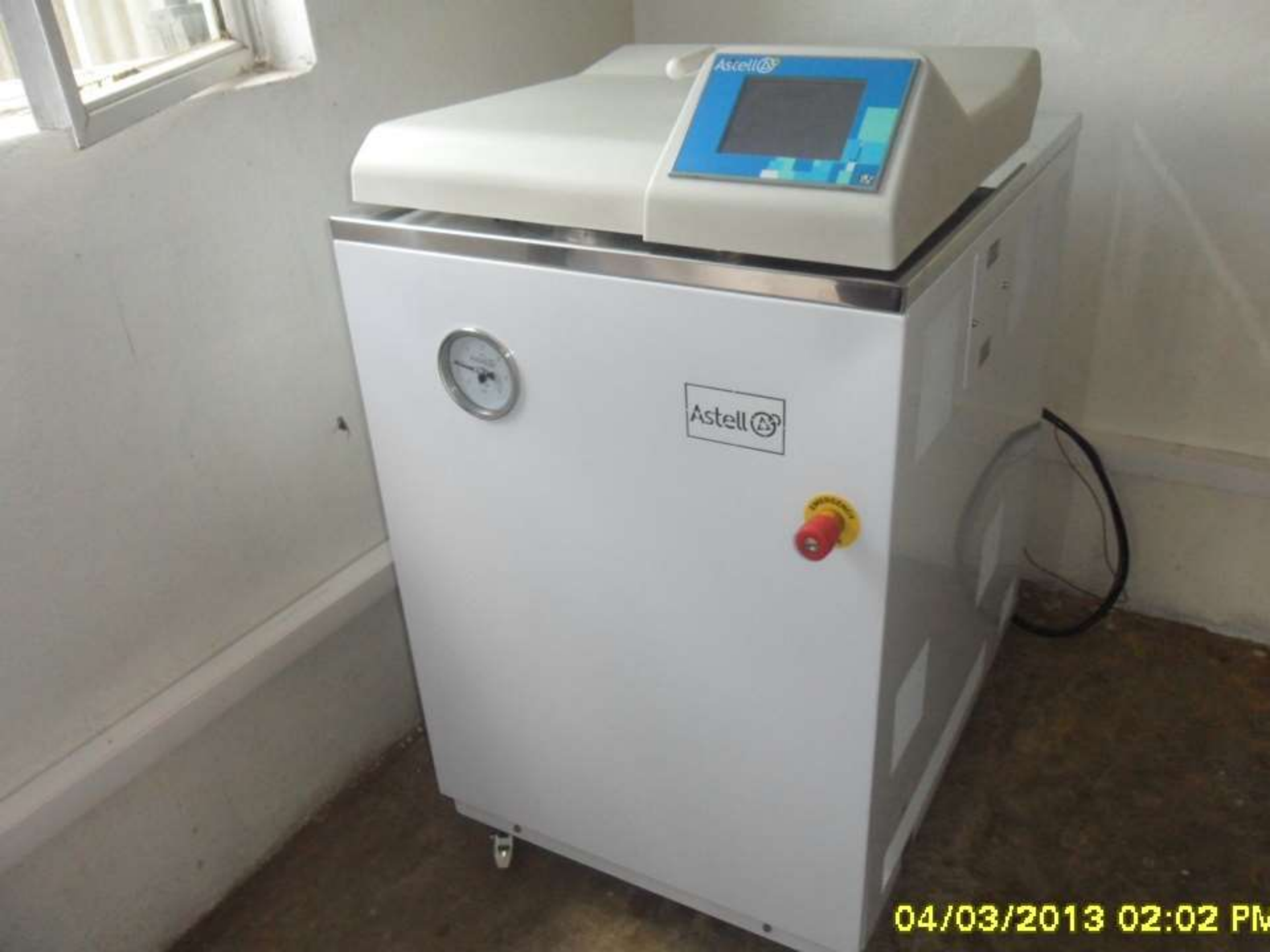
•Not only provide N but also improve the soil and plant health by providing growth promoting substances.

Farmers field trial using Soybean Inoculant

Rhizobium Inoculum production.

What are the steps of inocula production?

- Isolation
- Identification
- Characterization
- Authentication
- Preservation
- Multiplication
- Carrier selection , preparation and Inoculation of pure strain
- Labeling and packing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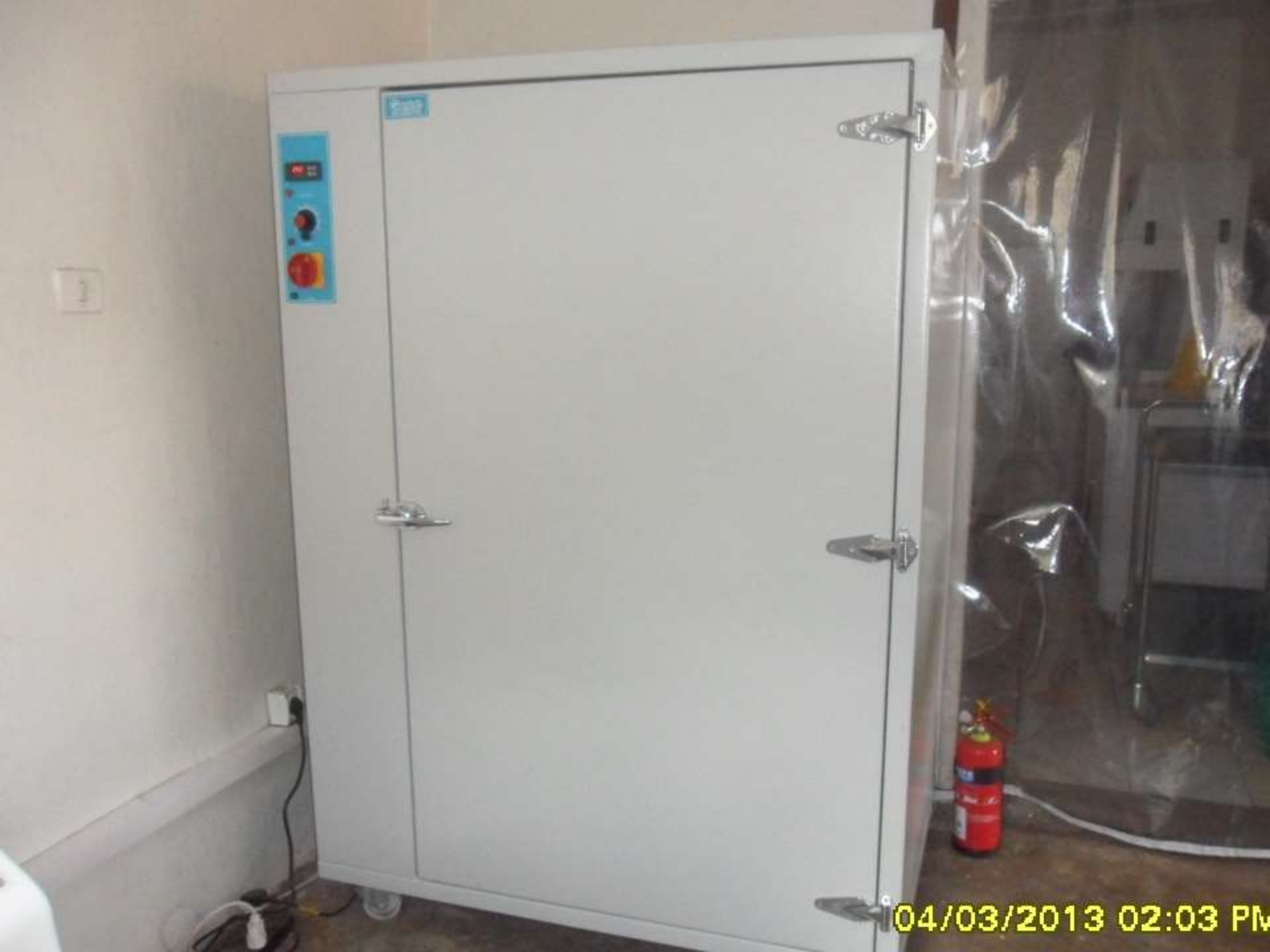
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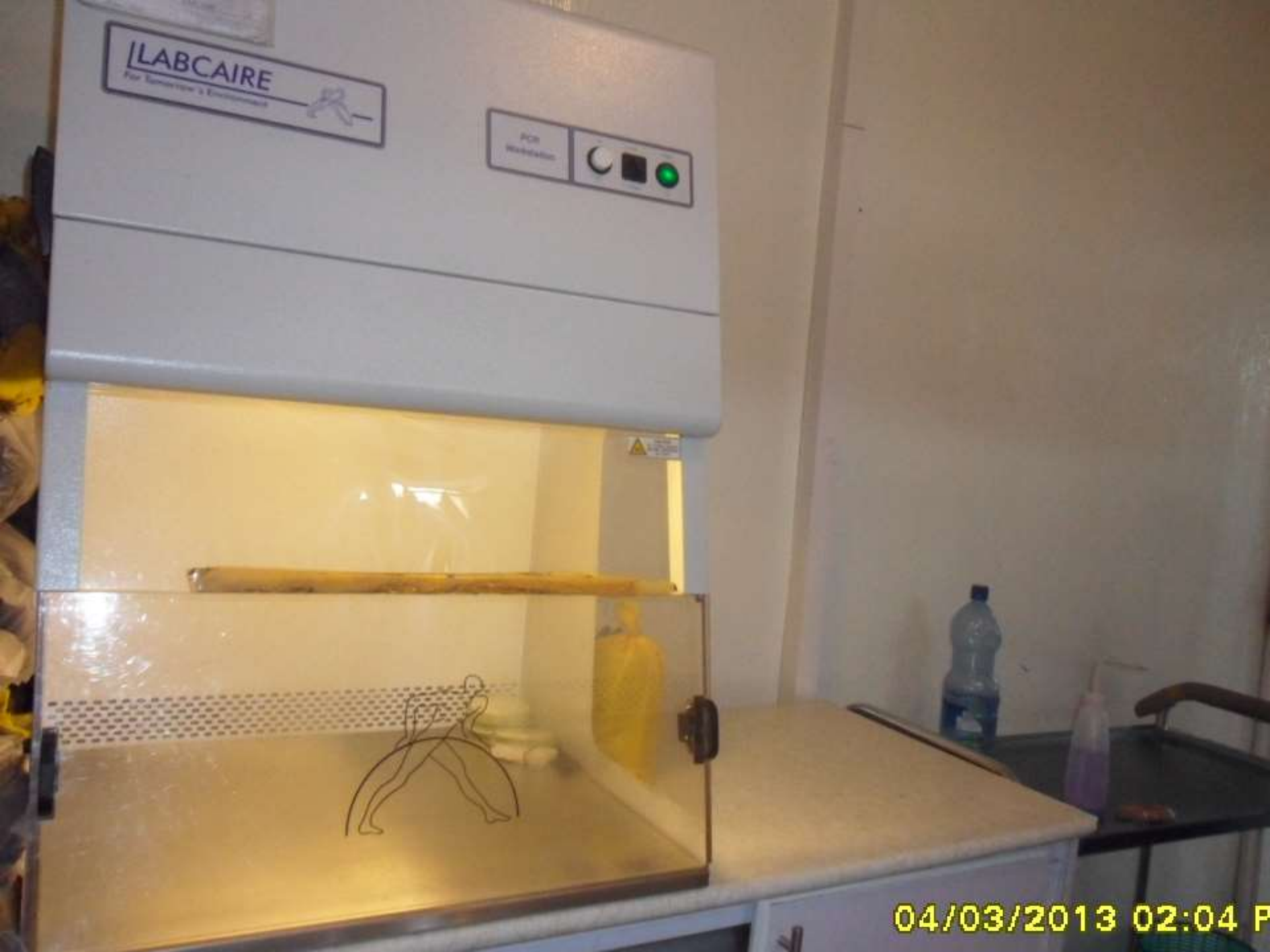
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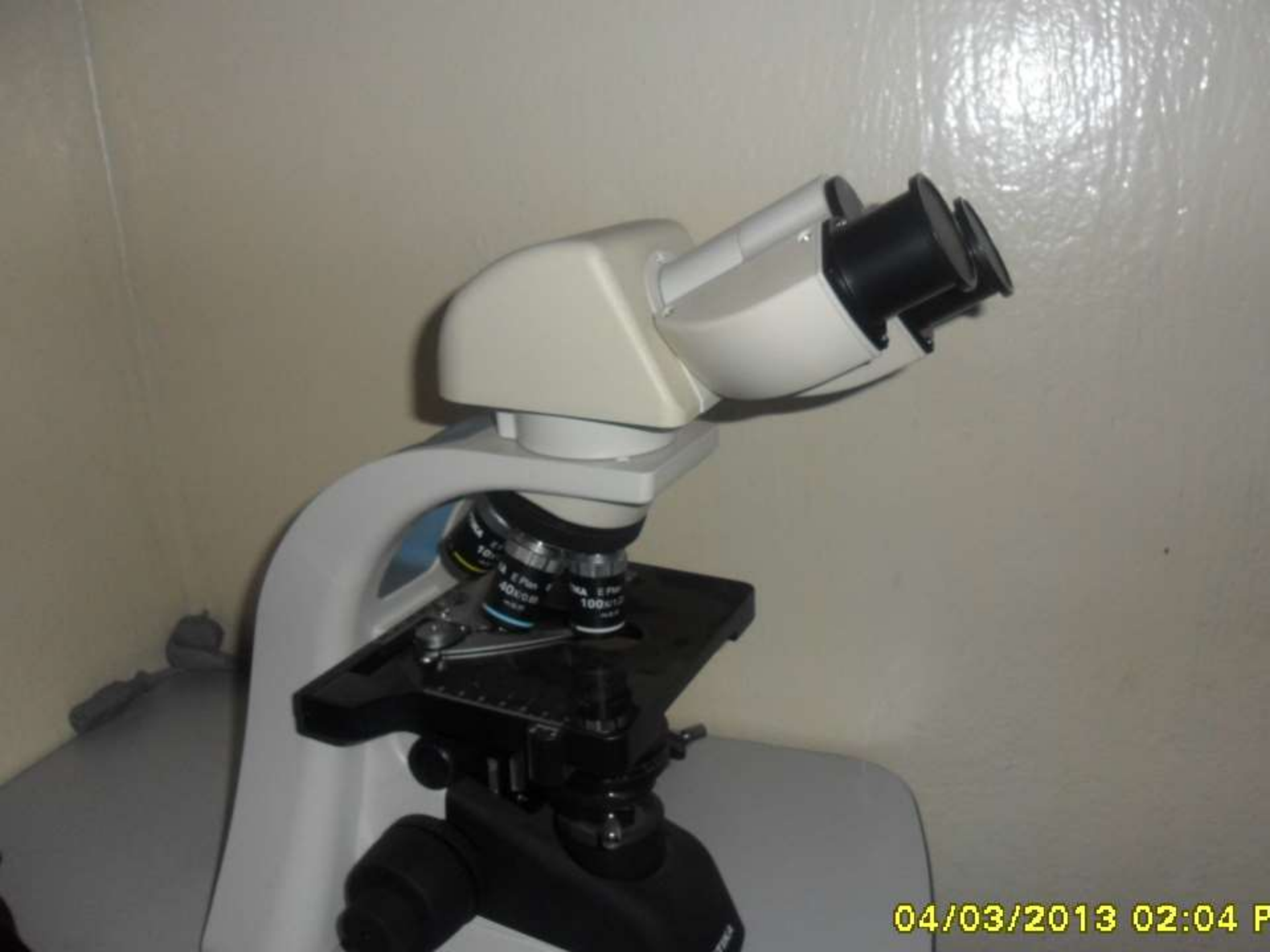
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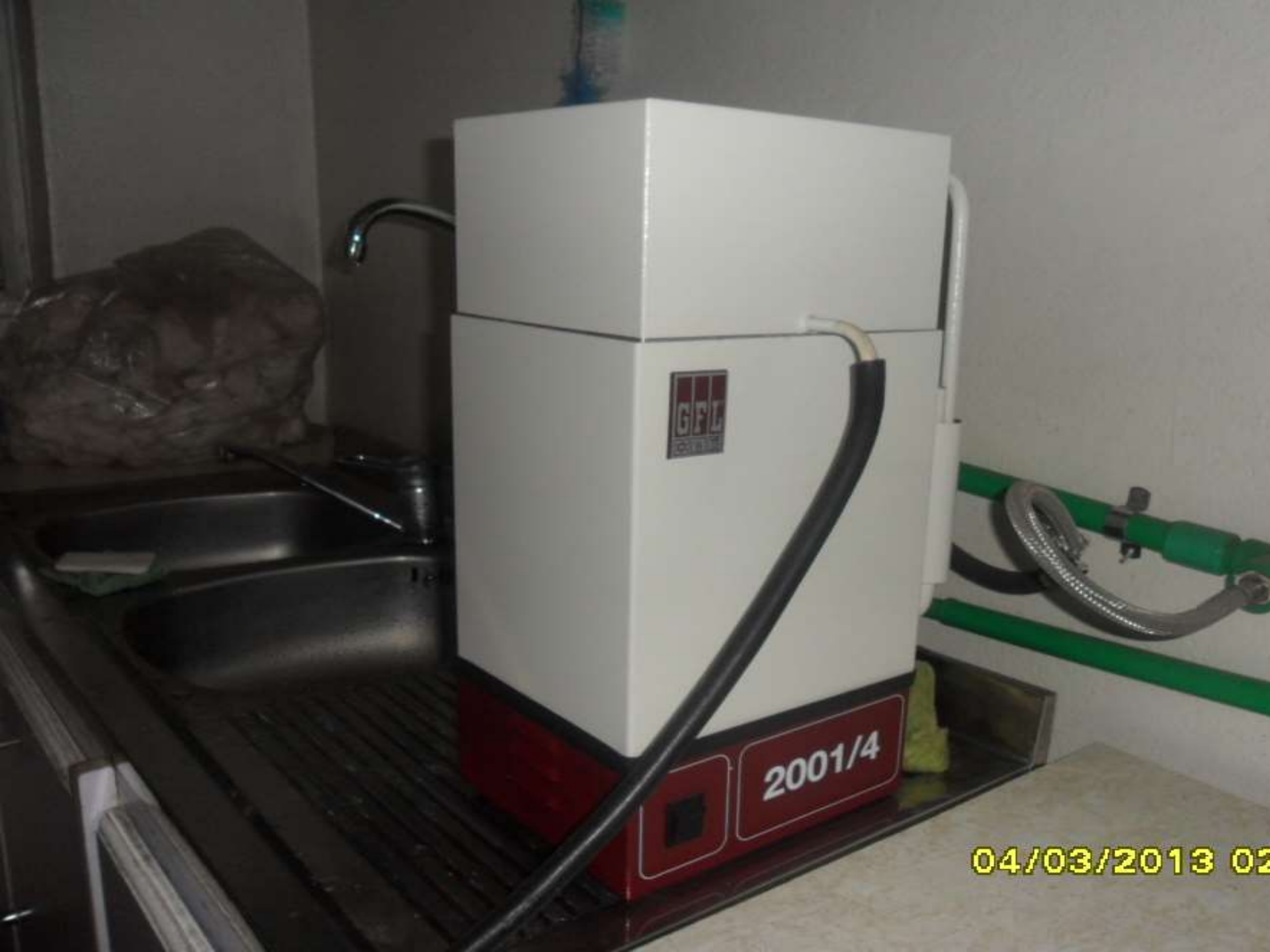
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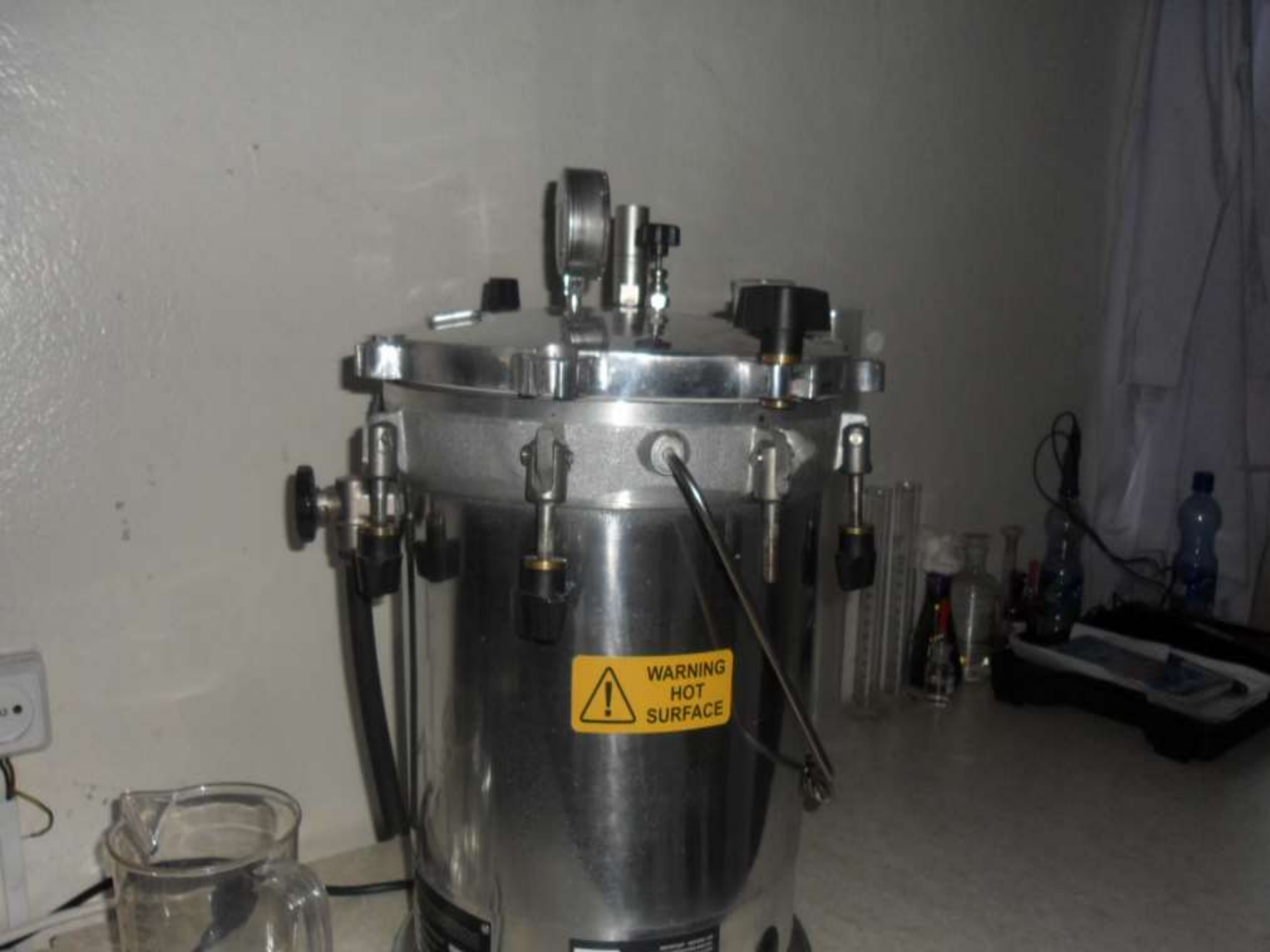
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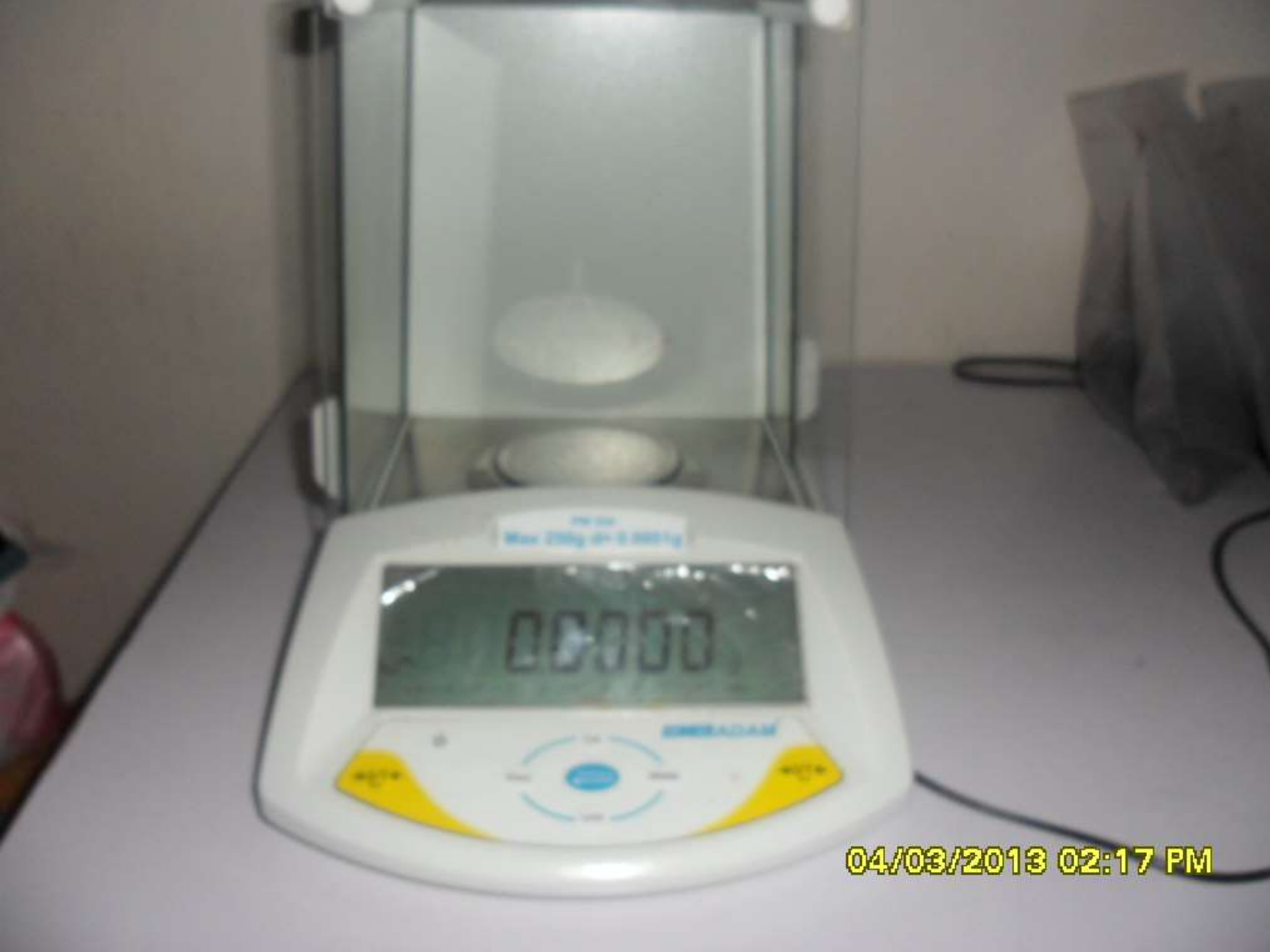
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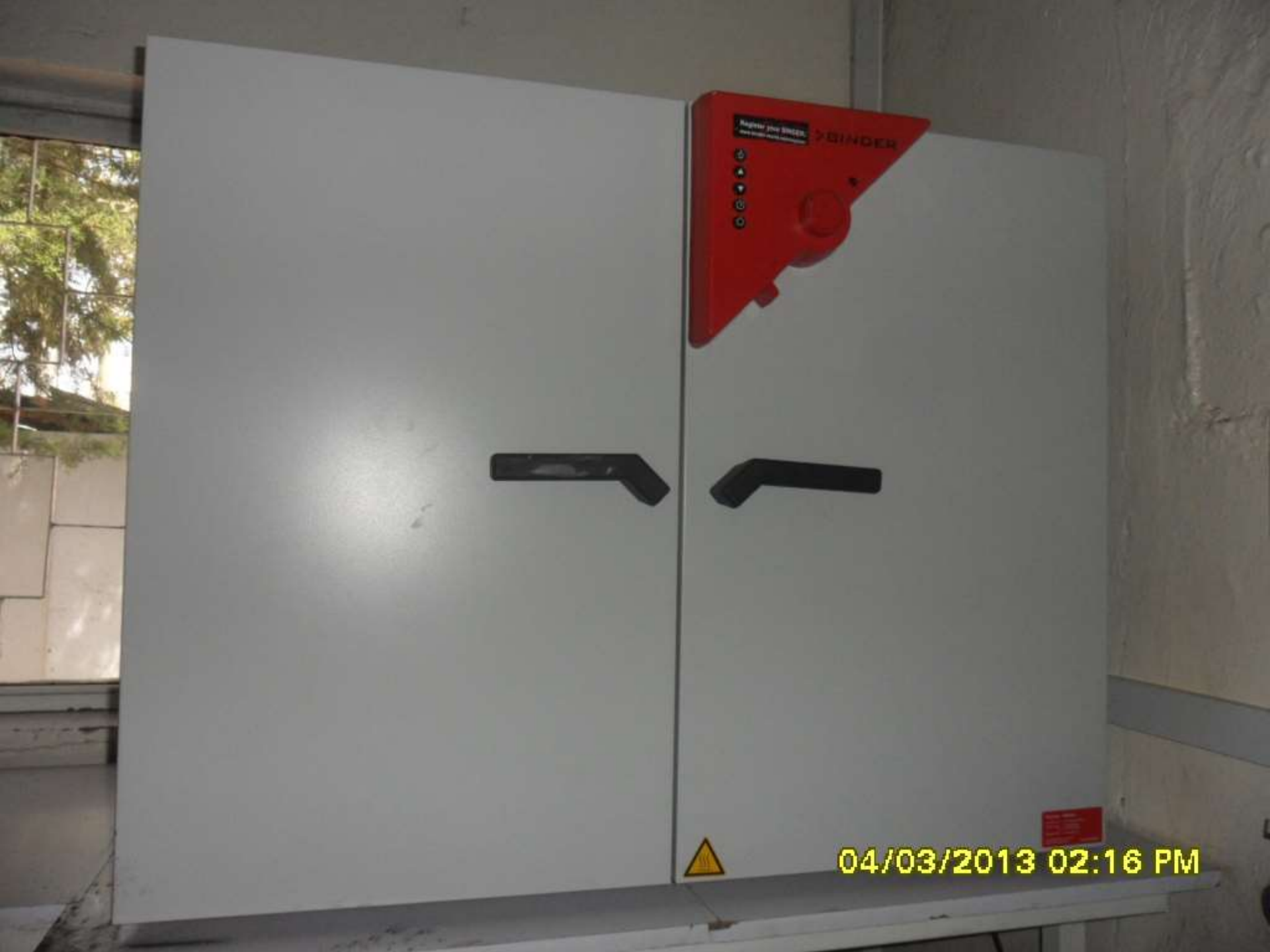
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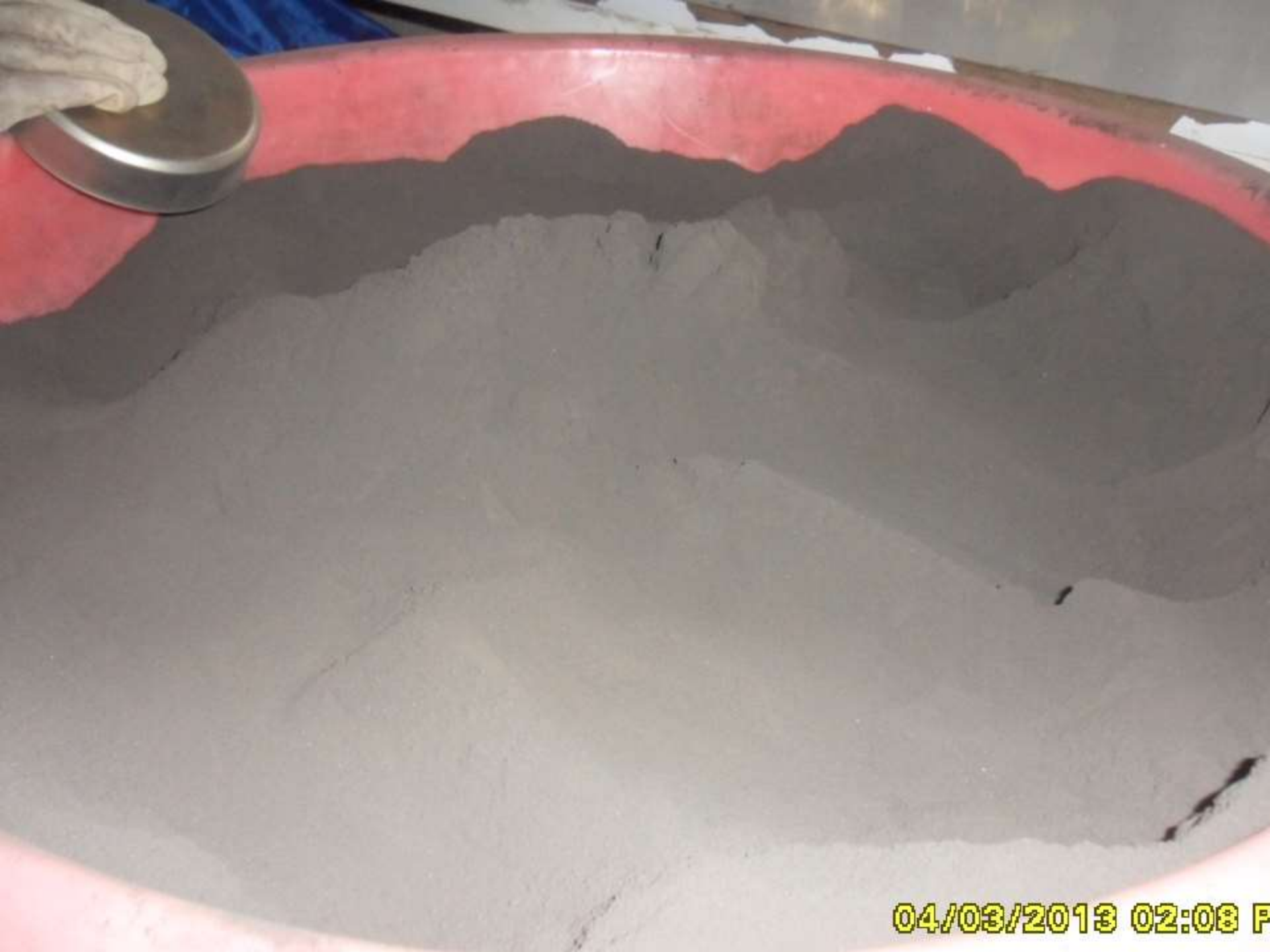
Characterstics of a good support/ carrier

- The support should be milled to a very fine powder which should pass through 100 µm mesh sieve and maintain the following desirable properties.
- Should be non toxic to bacteria
- Should have good moisture absorption capacity
- Should be adjusted to pH (6.5-7.0).
- Should be of fine particle size for a better adherence to seeds
- Should be free from lump-forming materials.
- Should be available in good quantity with low cost.
- Should have sufficient amount of carbon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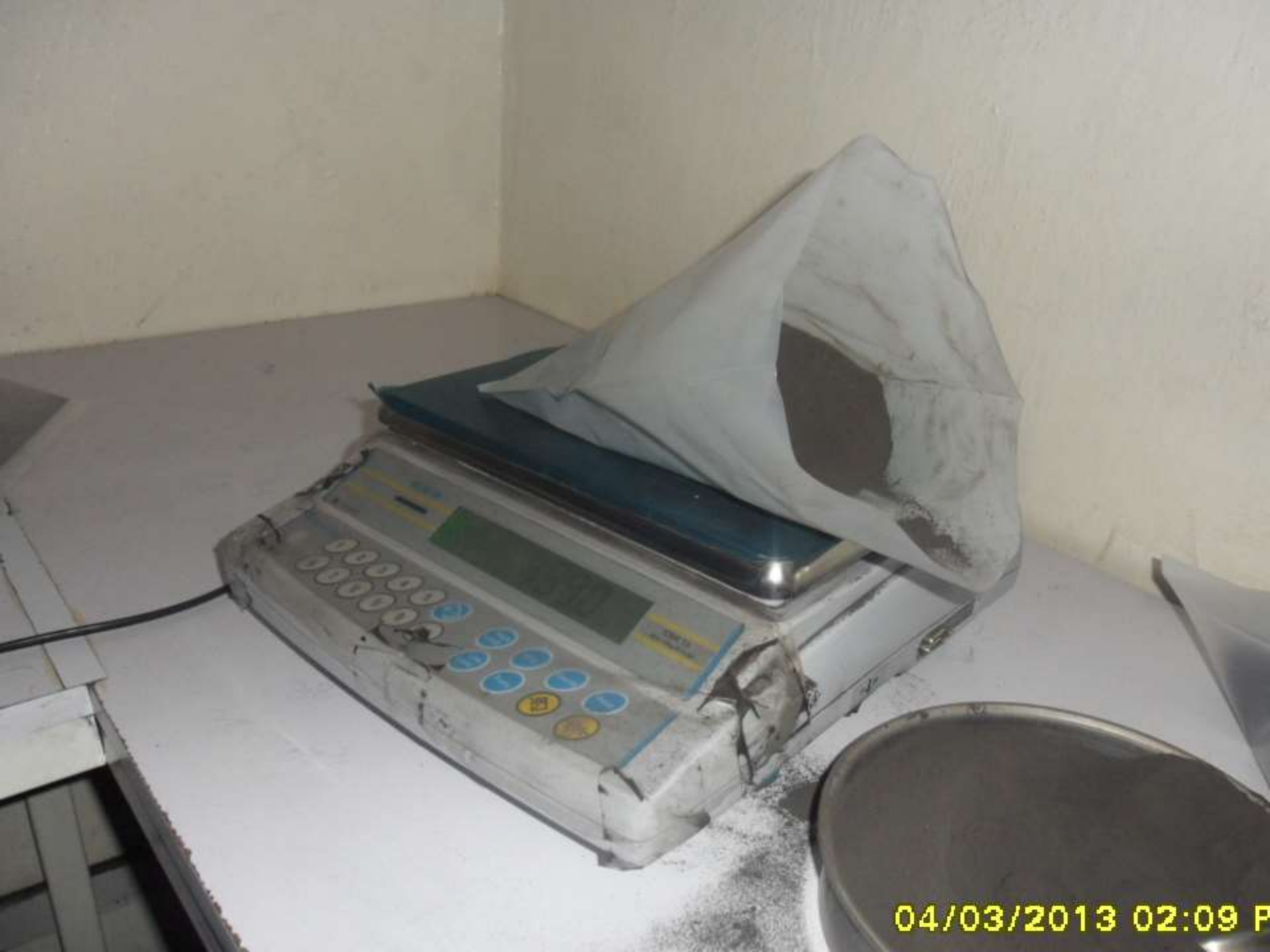
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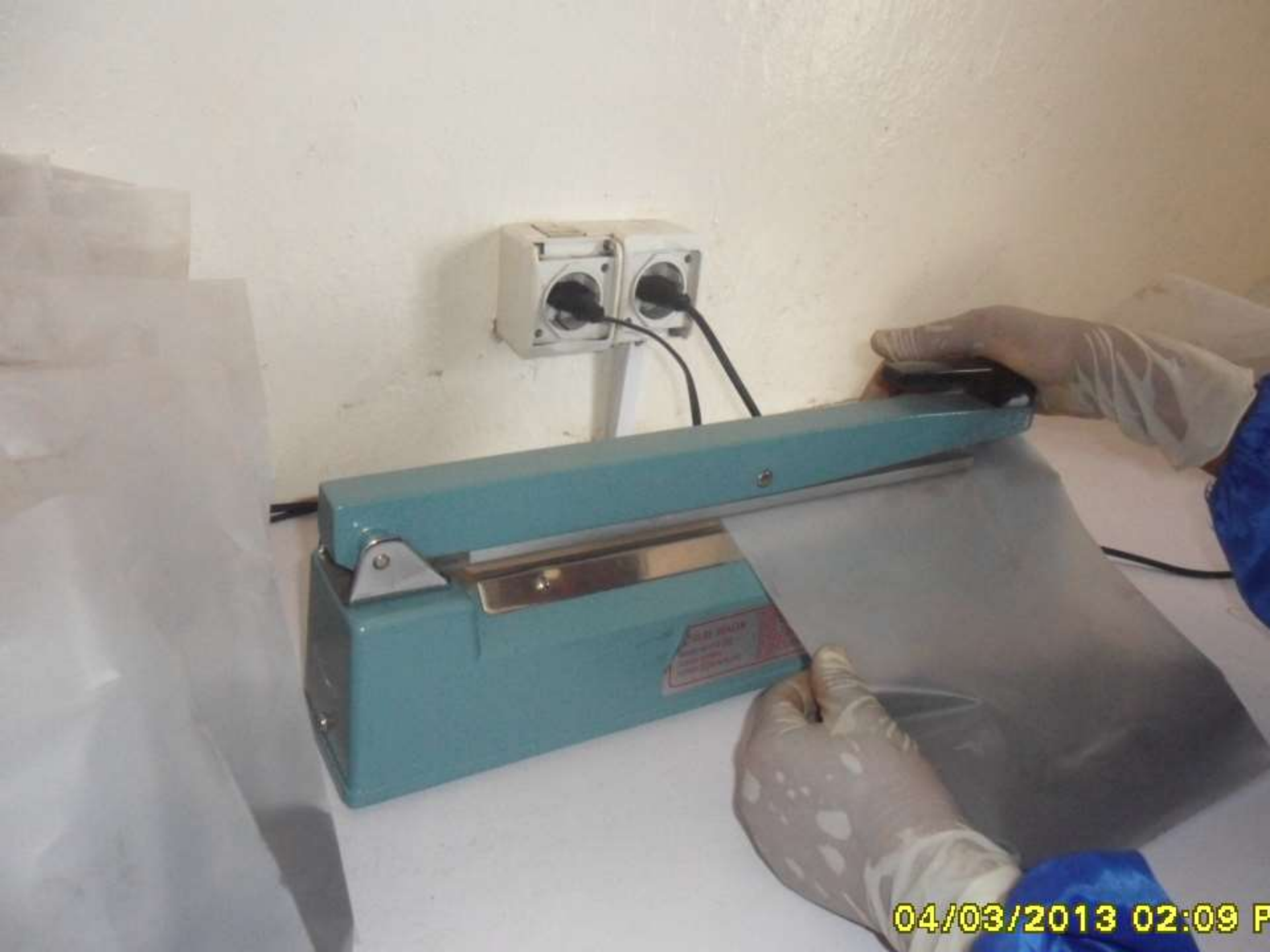
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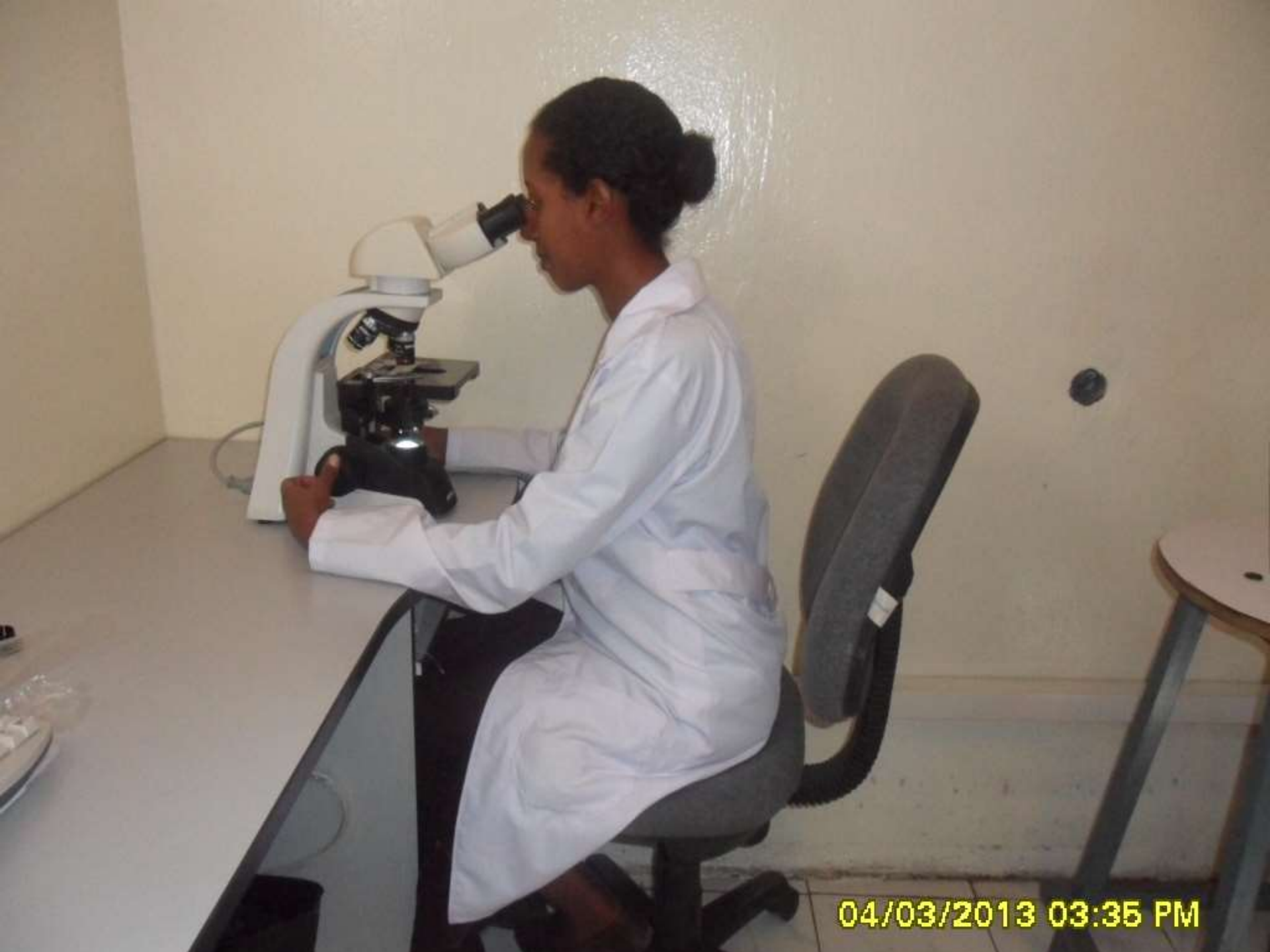
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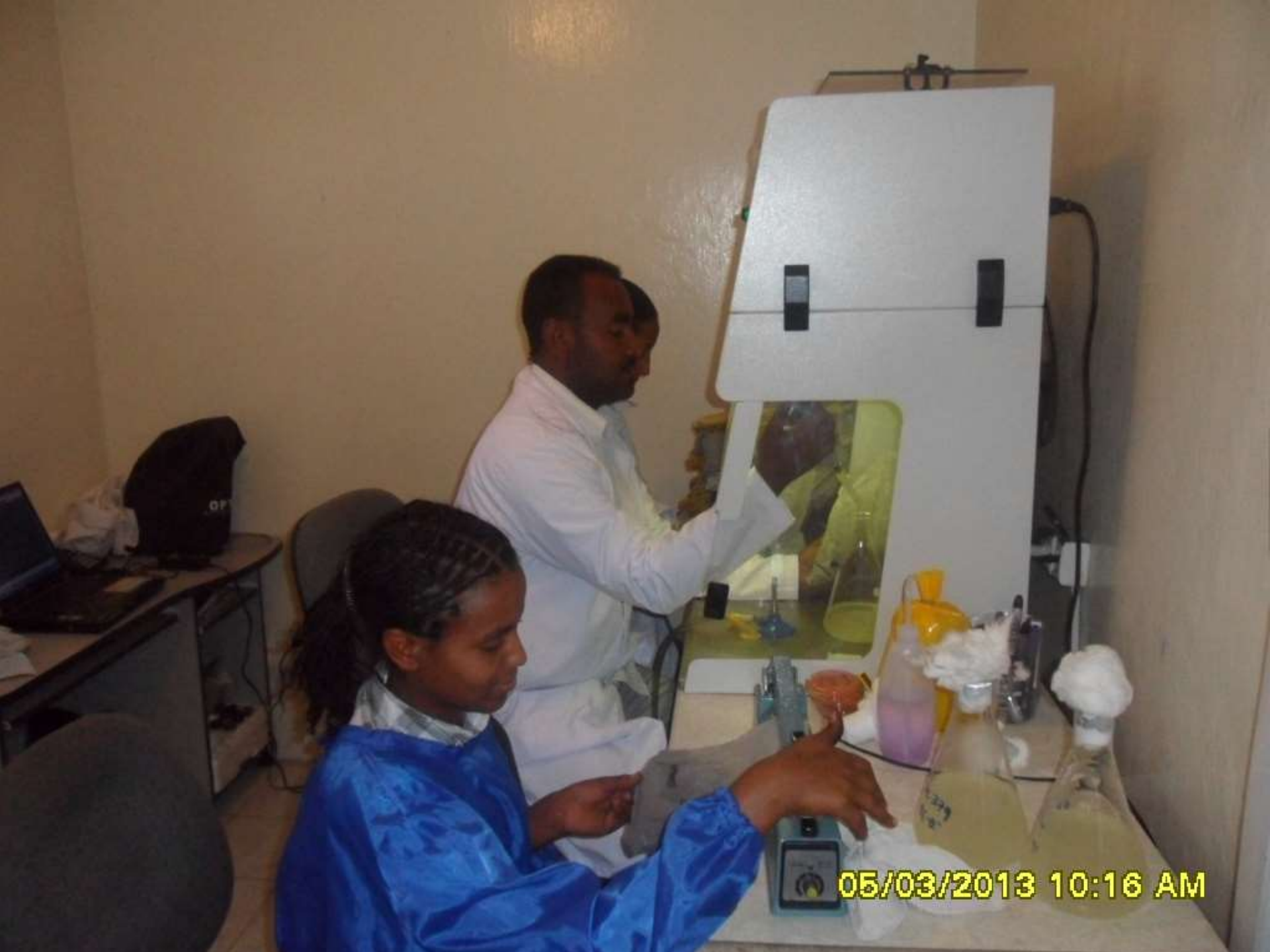
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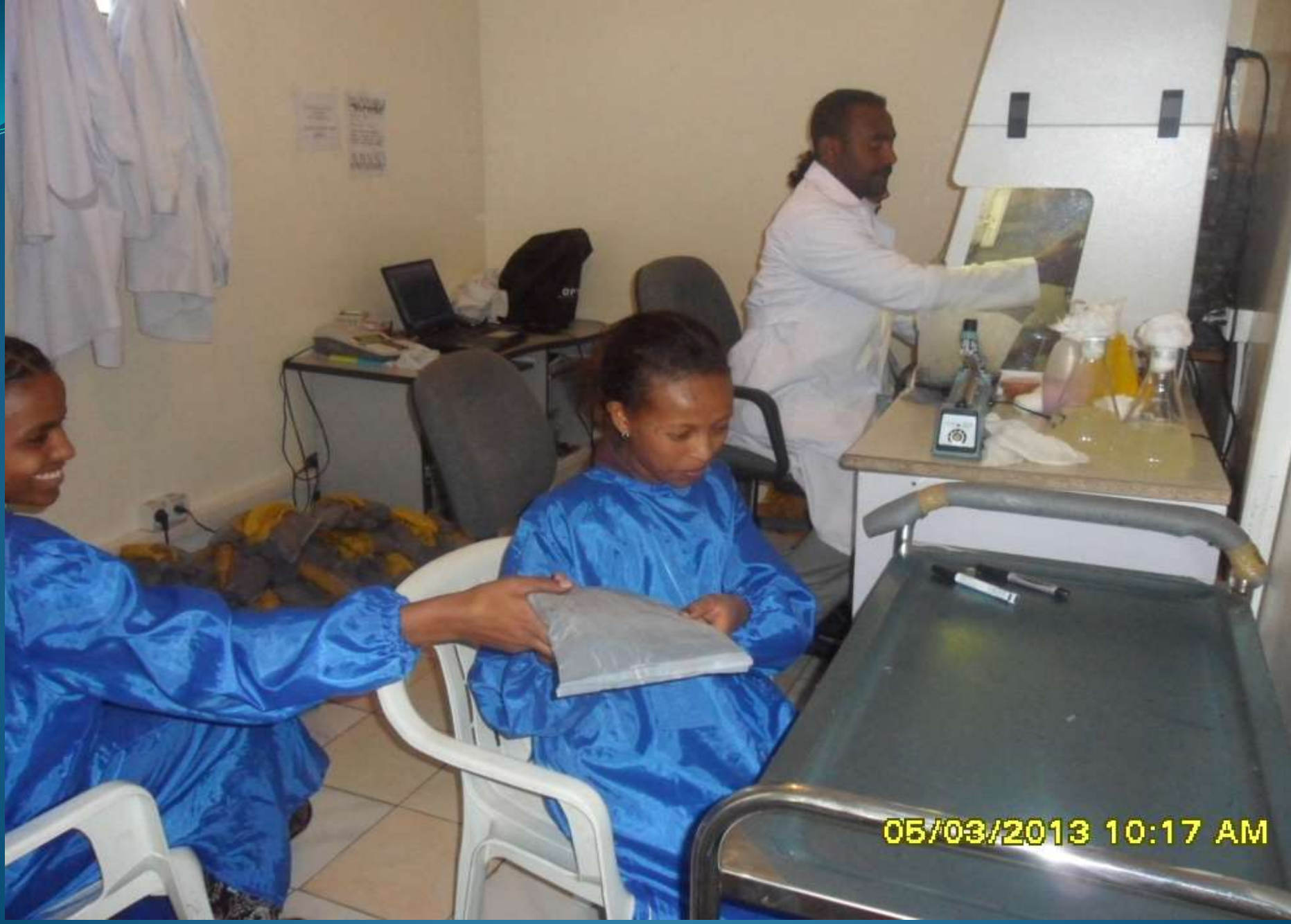
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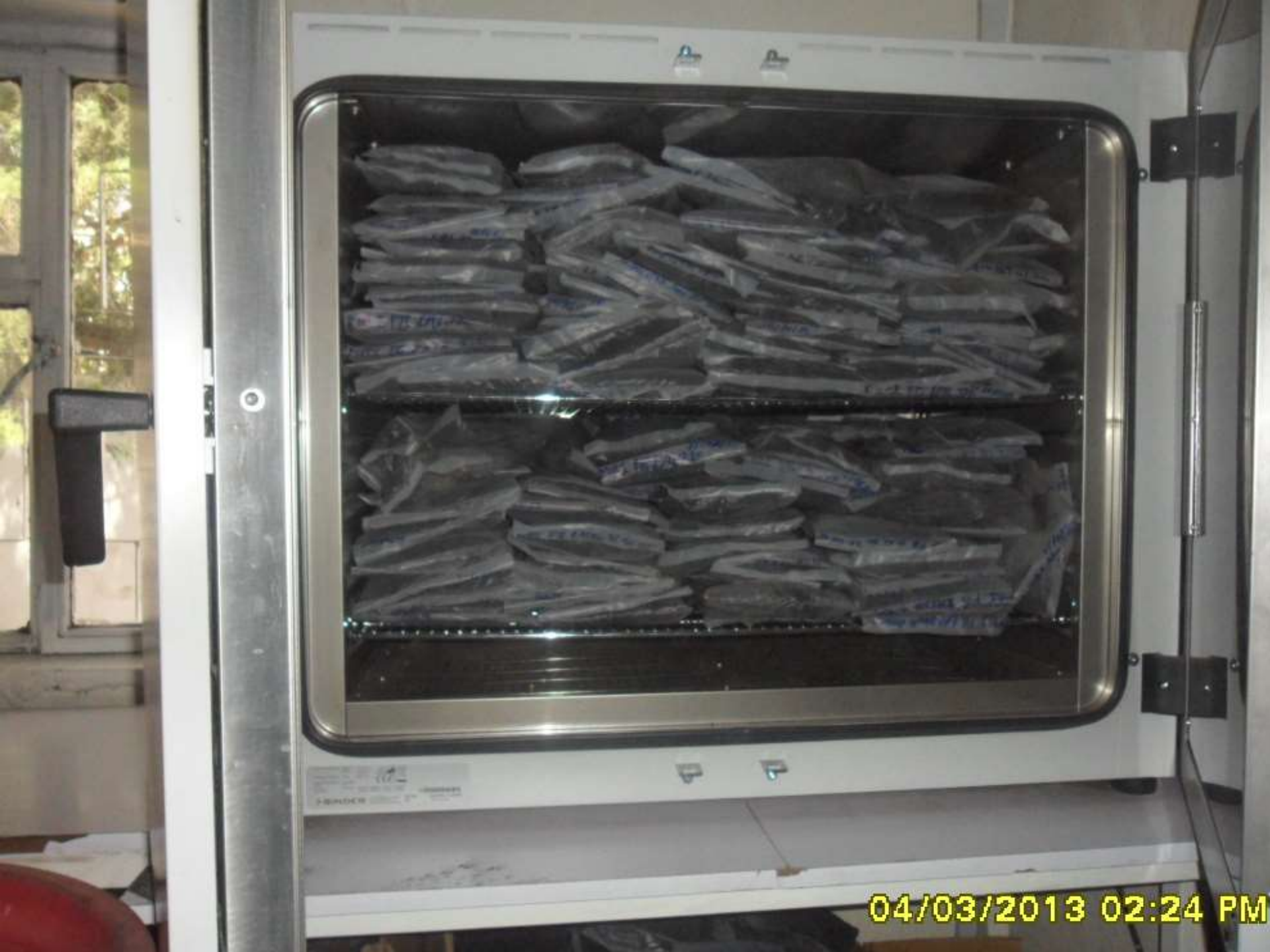
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Some Specification need for carrier-based *Rhizobium* Inoculants in Ethiopia.

1. The inoculants shall contain a minimum of 100,000,000(hundred million) viable cells of *Rhizobium* per gram of the carrier on dry-mass basis within 15 days of manufacture and 10,000,000(ten million) within 15 days before the expiry date marked on the packet when stored at 25-30 °c.
2. The inoculants shall have a maximum period of 12 months expiry from the date of its manufacturing.
3. The Inoculum shall not have any contamination with other microorganisms.
4. The pH of the Inoculants shall be 6. 5 - 7.0.

Some Specification need for carrier-based Cont…

5. The inoculants shall show effective nodulation within 60 days of inoculation and planting on all those species/ cultivars listed on the packet .
6. The carrier material shall be in the form of powder(capable of passing through 75-106 µm sieve)of peat, lignite, peat-soil or similar material neutralized with calcium carbonate and sterilized.
7. The quality of the inoculants should be controlled/ monitored.
8. The inoculants shall be packed in 50-60 µm low density opaque polyethylene packet.
9. Each packet should be marked legibly to give the following information.

Information on the Lables of Inoculants

a) Name of the product, especially as *Rhizobium* inoculants
b) Leguminous crop for which inoculation is intended
c) Name and address of the manufacturer
d) Type of carrier
e) Date of manufacture
f) Date of expiry
g) Net quantity meant for(0.25ha) and
h) Storage instructions worded as under

"Store in cool place away from direct sun and heat"

Menagesha Biotech Industry PLC experience

- Has a capacity of producing up to 100000 packets of biofertilzers
- In the past crop season produced 80000 packets of seven crops, i.e. FB, FP, HB, LN, SB, CP & MB
- Distributed 51000 packets

Conditions for Symbiotic Nitrogen Fixation

- Symbiotic fixing of nitrogen is the result of a delicate balance between a higher plant and specific bacteria. It is important to understand properly, the optimum conditions for this fixation in order to provide full benefit to plant-
- Good soil structure (aerated soil)
- No deficiency of molybdenum or boron
- Small amounts of nitrogen compounds in the soil
- Presence of a sufficient number of specific and effective *Rhizobium* strain
- Favorable plant development conditions (climate , farming methods, adapted varieties , absence of disease)
- In short to the greatest extent possible , factors limiting legume development must be eliminated to obtain adequate atmospheric nitrogen fixation. If these conditions are met BNF is the best solution for our second largest food crops (legume crops) production in our country.
- It is also wise to understand that BNF is not only that of *Rhizobium* affair but of many other genera of bacteria and cynobacteria..

THANK YOU