The use of Silicon Rubber with banana fibres and glass fibres to make Sports court ground by suitable technology to Egyptian environment

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Introduction:

Bananas are a unique annual crop, and after the fruit grows, the leaves and false trunks die to make way for buds and roots to replenish from the rhizome. Harvesting the crop requires dispensing of all other parts of the plant except the fruit, so these small shoots replace the original plant. This cycle continues for generations to infinite, and it is common for false leaves and trunks to be left to rot in farms or to clog the nutrient deficiency in the soil. Banana fibers are a more sustainable alternative to natural materials, although many people are unaware of their existence or use, and are mainly made of cellulose and lignin.

The high-resilience silicon resin is a kind of high temperature hardening polysilomen polymer, it has the advantages of organic resin and inorganic materials, and it has unique physical and chemical properties, good electrical insulation properties, heat resistance and waterproof effect. As for sports facilities, they are divided into open sports facilities and closed sports facilities (covered). Attached to open facilities are those facilities for the exercise of various sporting activities, including football, hockey and tennis, athletics fields (field and track) and swimming pools. It is possible to cover the floor of open fields in some sports activities with industrial materials such as tartan. Noting that when using these types of floor covering, it is preferable to use chemical antibodies to clean them from microbes and germs in order to prevent the transmission of diseases.

Key Words:

Silicon Rubber - glass fibers - banana fibers - Sports court.

Statement of the Problem:

- Inefficiency of the floors of open or closed sports fields in weather conditions such as heat and rain.
- The floors of sports fields are affected by constant pressure on them, which exposes them to damage and shredding.
- Most of these floors are imported from abroad and there is no Egyptian technology to produce them.

Study Significance:

The importance of research is evident in the following points:

- Production of floors with Egyptian technology suitable for open or closed sports fields and can withstand weather conditions such as heat or rain.
- Maximizing the utilization of textile fibers, such as banana and glass fibers, as reinforcement pads in sports field floors.
- Adapting silicon rubber in the production of sports ground floors.
- Shedding light on the economic aspects after the proposed production operations.

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Methodology of Research:

- The research is based on the methods of practical application and statistical analysis.

Objective of Research:

- Providing local qualities for sports stadium floors produced with Egyptian technology and using reinforced fillers of banana and glass fibers.

Practical Experiences

- Tensile Test) Galdabini-Quasar 600-Made in Italy) ASTM D638.
- Elongation Test) Galdabini-Quasar 600-Made in Italy) ASTM D638.
- Pressure Test) Galdabini-Quasar 600-Made in Italy) ASTM D695.
- Taber Abrasion (Taber Dual Abraser) ASTM D4060.

Procedural Steps for Research.

- 4 silicon rubber samples were produced with (two samples with banana fibers, two samples with glass fibers).

1. The first sample: 50 grams' banana fiber whiskers, 1 kg silicon rubber.
2. The second sample: 100 grams' banana fibers whiskers, 1 kg silicon rubber.
3. The third sample: 100 grams of fiberglass (1) woven layer, 1 kg of silicon paper.
4. The fourth sample: 200 grams of fiberglass (2) woven layer, 1 kg of silicon paper.

Research results:

The strengths and weaknesses of the four species produced through this research were recorded, and the observations were as follows:

- **The first sample (1 kg silicon rubber - 50 gm banana fiber)**

The average tensile strength of the first sample is 0.870 N / mm^2. The addition of banana fibers to silicon rubber has helped to strengthen the strength of silicon rubber.
In contrast, the elongation decrease was to 195.38%, as there was a decrease in the rate of elongation of silicon rubber.
The mean pressure stress was 1.540 N / mm^2. The addition of banana fibers to silicon rubber increased the sample's tolerance to pressure.
And wild resistance 92 mg. It is a relatively high weight loss.

- **The second sample (1 kg silicon rubber - 100 gm banana fiber)**

The average tensile strength of the second sample is 0.732 N / mm^2. The addition of banana fibers to silicon rubber has helped to strengthen the strength of silicon rubber.
In contrast, elongation was 307.97%, where there was a relative increase in the percentage of elongation of silicon rubber after adding a larger amount of banana fibers than the first sample.
The average pressure stress is 1.562 N / mm^2. It is an average slightly larger than the first sample.
Wild resistance of the second sample 31 mg. It is the lowest weight loss among all samples.

- **The third sample (1 kg silicon rubber - 100 gm fiberglass woven)**

The average tensile strength of the third sample was 1.580 N / mm^2. That is, adding the fiberglass to the silicon rubber resulted in an increase in the tensile strength of the sample by a greater amount of banana fibers when added to the same amount of silicon reaper. As for the elongation of the samples, the elongation increased to 433.07%, which makes them the closest samples elongation compared to the elongation of the silicon raw rubber, which is estimated at 700%.
The average pressure stress of the third sample is 1.485 N / mm^2.
Wild resistance of the third sample is 41 mg. It is a relatively small weight loss.

- **The fourth sample (1 kg silicon rubber - 200 gm woven fiberglass)**

The mean tensile strength of the fourth sample was 1.697 N / mm^2, which is the highest recorded tensile strength ratio of the samples. With the increase in the amount of fiberglass added to the silicon rubber, the strength of the tensile strength increased by a greater amount, but a significant decrease in elongation reached 179.59%.
The mean pressure stress of the fourth sample was 1.948 N / mm^2, which is the highest tolerance for pressure on samples
The wild resistance of the fourth sample is 148 mg. It is a very high weight loss.

Interpretation of the results.

• It is clear from the previous results that the third sample is the ideal sample for the work of the sports stadiums appropriate for tracks or field for small sports, due to the increase in the strength by an appropriate amount while maintaining the highest amount of elongation, as it is one of the least samples regarding losing weight and land resistance. These are very suitable qualities for the track and field halls and gymnasium floors, which allows a significant decrease in the percentage of sports athletes injuries, and not affected by conditions of weather conditions such as high temperature, coldness and rain.
• It is also clear from the previous results that the second sample, despite the reduced amount of stress it had compared to the rest of the samples by a small amount and high elongation, and the lack of weight loss and resistance to the ground, which is also suitable for the work of athletics track grounds and stadium floors and gyms where it has a high elongation and appropriate stress strength, they have very appropriate environmental functions where the materials and synthetic fibers are replaced with environmentally friendly materials such as banana fibers.
• The fourth sample is considered the lowest quality of the results, despite its high strength, but it has flexibility, weak elongation, little resistance to land and high weight loss, and these characteristics are somewhat inappropriate for sports stadiums and athletics track, which require constant friction and high strength among the players 'shoes and floor track or stadium, and it is also not suitable for volatile weather conditions such as high temperature, coldness or rain.
• As for the first sample, it is primarily an economic sample. It appears to us in the case of wanting to get the lowest cost of raw materials, given that it contains only 50 grams of banana fibers added to silicon rubber compounds, in the case of neglecting the relatively high weight loss as a result of continuous friction, which Makes it in a constant state of maintenance to prevent injury to athletes.

• It is clear from the results of the samples, the important economic aspect in producing this type of stadium flooring in a simple way and in a pure Egyptian style, as the material of banana fibers was used instead of burning or disposing in a way that achieves an important environmental aspect. The glass fibers are used for reinforcement, which gives a large part of the continuity of the floor with some maintenance. As for the silicon material, it is less expensive than other materials used to cover sports fields.

Recommendations.

The research recommendations are summarized in the following points:

1. Achieving cooperation between the Ministry of Industry and the Ministry of Youth and Sports to produce playgrounds with Egyptian technology for open or closed sports stadiums that can withstand weather conditions and reduce muscle or bone injuries.
2. Shed light to take advantage of the textile fibers used in industrial purposes such as banana fibers and glass fibers to make strengthening pads in the sports stadium floors.
3. Paying attention to the silicone material due to its great industrial importance.
4. Highlighting the economic aspects after the proposed production operations.

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