



Revamping Electroadhesive Clutches for Robotics and Wearables

Description

The team wrote a paper called "[High Performance Electroadhesive Clutches with Multilayered Architecture](#)." This paper was published on February 14 in the journal *Science Advances*. Colgate is the main author of the paper. Bekir Aksoy, a postdoctoral researcher at the [Center for Robotics and Biosystems](#), is the first author.

Electroadhesive (EA) clutches can help in robots and in devices we use with our hands. But these clutches can break because the stress is not even when they are working.

To understand this problem, the team watched the clutch while it worked. They made one side clear so they could see when it broke. They found that stress built up unevenly, which caused cracks.

"We redesigned the clutch to have layers that spread the stress evenly," said Aksoy. This new design works better. It can hold more force while using less energy, which is important for many uses.

One use is a small device for finger rehabilitation. This device helps people recover from injuries or illnesses.

"This technology has many possibilities," Aksoy said. "We hope to improve it for health and robots."

Vocabulary List:

1. **Electroadhesive** /,ɪlɛk.trəʊ.ə'di:.sɪv/ (adjective): Relating to a technology that uses electric charge to create adhesion.
2. **Clutch** /klʌtʃ/ (noun): A device that connects and disconnects power transmission often used in vehicles or mechanical applications.
3. **Rehabilitation** /,rɪ:.hə'bɪl.ɪ.teɪ.ʃən/ (noun): The process of restoring someone to health or normal life through training and therapy after illness or injury.
4. **Stress** /strɛs/ (noun): A state of mental or emotional strain resulting from challenging circumstances.
5. **Redesigned** /,rɪ:.dɪ'zaɪnd/ (verb): To design something again or in a different way.
6. **Energy** /'ɛn.ər.dʒi/ (noun): The strength and vitality required for sustained physical or mental activity.

Comprehension Questions

Multiple Choice

1. Who is the main author of the paper "High Performance Electroadhesive Clutches with Multilayered



Architecture"?

- Option: Colgate
- Option: Bekir Aksoy
- Option: Ratan Naval Tata
- Option: Jeff Bezos

2. Which journal published the paper "High Performance Electroadhesive Clutches with Multilayered Architecture"?

- Option: Science
- Option: Nature
- Option: Science Advances
- Option: Robotics Today

3. Who is the first author of the paper "High Performance Electroadhesive Clutches with Multilayered Architecture"?

- Option: Colgate
- Option: Bekir Aksoy
- Option: Ratan Naval Tata
- Option: Elon Musk

4. What is the main purpose of Electroadhesive (EA) clutches?

- Option: To break easily
- Option: To spread stress unevenly
- Option: To hold more force using less energy
- Option: To make loud noises

5. What problem did the team observe while studying the clutch?

- Option: Uneven stress causing cracks
- Option: Invisibility
- Option: Uniform stress distribution
- Option: Lack of interest

6. What did the team add to the redesigned clutch to spread stress evenly?

- Option: Extra weight
- Option: Multiple layers
- Option: Glowing lights
- Option: Fragile material



True-False

7. Electroadhesive (EA) clutches can help in robots and devices we use with our hands.
8. The team made both sides of the clutch clear to observe stress buildup.
9. The redesigned clutch can hold less force compared to the original design.
10. One use of the new clutch design is for finger rehabilitation.
11. Bekir Aksoy hopes to improve the technology for health and robots.
12. Stress built up unevenly in the original clutch design according to the team's observations.

Gap-Fill

13. The paper "High Performance Electroadhesive Clutches with Multilayered Architecture" was published on February 14 in the journal _____.
14. The new clutch design can hold more force while using _____ energy.
15. The redesigned clutch has layers that help spread stress _____.
16. One use of the redesigned clutch is for _____ rehabilitation.
17. Bekir Aksoy is a postdoctoral researcher at the Center for _____ and Biosystems.
18. According to Bekir Aksoy, the technology of the redesigned clutch has many _____.

Answer

Multiple Choice: 1. Colgate 2. Science Advances 3. Bekir Aksoy 4. To hold more force using less energy
5. Uneven stress causing cracks 6. Multiple layers

True-False: 7. True 8. False 9. False 10. True 11. True 12. True

Gap-Fill: 13. Science Advances 14. less 15. evenly 16. finger 17. Robotics 18. possibilities



Vocabulary quizzes

Multiple Choice (Select the Correct answer for each question.)

1. What is the primary purpose of encryption in cybersecurity?
Option: A. Enhancing privacy
Option: B. Boosting energy efficiency
Option: C. Improving manufacturing processes
Option: D. Reducing stress levels
2. What term is used to describe bacteria that are resistant to multiple antibiotics?
Option: A. Germs
Option: B. Immune cells
Option: C. Ceramics
Option: D. Industries
3. What is the term for data that has been coded to prevent unauthorized access?
Option: A. Powerful
Option: B. Dangerous
Option: C. Encrypted
Option: D. Threatening
4. Which aspect of data protection focuses on ensuring individuals have control over their personal information?
Option: A. Rehabilitation
Option: B. Stress
Option: C. Privacy
Option: D. Protection
5. Which industry is primarily concerned with the development of aircraft and spacecraft?
Option: A. Manufacturing
Option: B. Protection
Option: C. Aerospace
Option: D. Properties
6. What process involves the production of goods using machinery tools and labor?
Option: A. Consequences
Option: B. Threat
Option: C. Manufacturing
Option: D. Research



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7. What term refers to something made or produced by human beings rather than occurring naturally?
- Option: A. Complex
 - Option: B. Artificial
 - Option: C. Immune
 - Option: D. Energy
8. Businesses strive to meet the needs and expectations of which group to ensure success?
- Option: A. Customers
 - Option: B. Clutch
 - Option: C. Electroadhesive
 - Option: D. Redesigned
9. Which sector includes various branches of economic activity such as agriculture manufacturing and services?
- Option: A. Industries
 - Option: B. Protection
 - Option: C. Government
 - Option: D. Warrant
10. What are the outcomes or results of a particular action or event?
- Option: A. Stress
 - Option: B. Consequences
 - Option: C. Threat
 - Option: D. Immune

Gap-Fill (Fill in the blanks with the correct word from the vocabulary list.)

11. _____ is the process of converting information or data into a code to prevent unauthorized access.
12. _____ plays a crucial role in regulating various aspects of society including policies and laws.
13. Businesses need to understand the needs and preferences of their _____ to provide tailored products and services.
14. Scientific _____ is essential for advancements in various fields from medicine to



technology.

15. Some viruses and bacteria have evolved to become _____ superbugs due to antibiotic resistance.
16. Excessive _____ can have negative effects on both physical and mental health.
17. _____ are often used in aerospace applications due to their lightweight and heat-resistant properties.
18. The body's _____ system helps protect against infections and diseases.
19. Cyberattacks pose a significant _____ to data security and privacy.
20. Physical therapy is often used in _____ programs to help patients recover from injuries.

Matching Sentences (Match each definition to the correct word from the vocabulary list.)



21. Ensuring the of sensitive data is a critical concern for organizations in the digital age.
22. Some intelligence gathering involves the use of intelligence to analyze large sets of data.
23. The rise of presents a significant challenge to modern medicine.
24. Understanding the nature of the universe is a goal pursued by many scientists.
25. The sector plays a key role in producing goods for consumption.
26. Sensitive information should be securely to prevent unauthorized access.
27. Various contribute to the overall economic development of a country.
28. Renewable sources of play a crucial role in sustainable development.
29. Identifying and mitigating cybersecurity is essential for protecting digital assets.
30. Practicing mindfulness and relaxation techniques can help reduce levels.

Answer

Multiple Choice: 1. A. Enhancing privacy 2. A. Germs 3. C. Encrypted 4. C. Privacy 5. C. Aerospace
6. C. Manufacturing 7. B. Artificial 8. A. Customers 9. A. Industries 10. B. Consequences

Gap-Fill: 11. Encryption 12. Government 13. Customers 14. Research 15. Powerful 16. Stress 17. Ceramics
18. Immune 19. Threat 20. Rehabilitation

Matching sentence: 1. Protection 2. Artificial 3. Superbugs 4. Complex 5. Manufacturing 6. Encrypted
7. Industries 8. Energy 9. Threat 10. Stress

CATEGORY

1. Sci/Tech - LEVEL1

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