UNIVERSITE OUAGA I Pr Joseph KI-ZERBO
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EPREUVE ECRITE D'ANGLAIS

Cette épreuve comporte deux (02) pages

The Advantages of Manufacturing Optical Fibre in Space

In the 1970s, when America's space programme was being tried, one idea arose that there were products which might be made more easily in space than on Earth: metal foam is an example. Such dreams came to nothing because the cost of manufacturing in space was never lower than on Earth.

Two Californian firms, namely, Made in Space and FOMS (Fibre Optic Manufacturing in Space) think that they have the solution. They are both proposing optical fibre of the highest quality in the free-falling conditions of the International Space Station. At one million dollars a kilogram, this material is worth the trip to and from space.

Optical fibres are made by pulling glass into strands which have a diameter similar to that of human hair. Cables filled with these fibres have revolutionized telecommunications. When a telephone call is encoded as laser pulses and sent through an optical fibre, it can travel a far greater distance, with a lower cost of signal quality, than if the message involved had been transmitted through a cooper wire. As a consequence, except for the last few hundred metres of connection to the customer, cooper cabling has almost disappeared.

Optical fibre could be better than it is. The glass used contains impurities that absorb and diffuse part of the light passing through it. This can be ameliorated by adding germanium which reduces absorption and diffusion. But that is not a perfect answer. The best solution known in principle was found in 1975, by researchers at the University of Rennes, in France. It is a glass made from a mixture of the fluorides of zirconium, barium, lanthanum, aluminum and sodium that is therefore known as ZBLAN. Fibre made from ZBLAN has extremely low losses from absorption and diffusion, particularly in the part of the spectrum called the mid-infrared, where conventional optical fibre does not work well.

ZBLAN fibres are though fragile. That makes drawing one that is more than about a kilometer long a hard task which, in turn, makes them useless for long distance work. They also tend to contain tiny crystals that form when the material is cooling. These reduce the lack of absorption and diffusion that otherwise give ZBLAN its advantages.

However, in the absence of stresses caused by gravity on the cooling material, much longer fibres could be drawn. Nor would the crystals form. And the one large place under human control where such stresses are absent is the space station.

Both firms, Made in Space and FOMS, say they have built apparatus to produce ZBLAN fibres that is small and light enough to send to, and operate in, the space station. Made in Space's machine has some similarities to the sort of 3D printer used by amateurs. It ingests a pre-formed pencil of ZBLAN. A stove melts the tip of this pencil. Thin strands of fibre are then pulled from the molten area. But instead of being used to form an object while still soft, these strands are coated with a second sort of glass for protection and then spooled onto reels for storage.

Adapted from The Economist, September 2018

Vocabulary

- is worth the trip: mérite le voyage
- strand: fil, brin
- molten: fondu
- to spool: dévider (un fil)
- reel: bobine

A. Guided Commentary

1) According to the text, which idea derived from the USA's space program? (2 points)

2) Relying on the text, state the obstacle which had prevented for a long time this idea from being achieved. (2 points)

3) Basing on the text, give two advantages of optical fibre on telecommunication. (3 points)

4) Give two reasons why ZBLAN fibres are said to be fragile according the text. (3 points)

5) Referring to the text, provide two reasons why the space station is the best place for ZBLAN fibres. (4 points)

Essay: (6 points)

In sixty (60) words maximum, explain how optical fibre can contribute to the development of your country.
