FIRST STUDY OF LITHIUM BORON COMPOSITE AS PLASMA FACING MATERIAL

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The composite boron-lithium material (CBLM) consists of a lithium boride matrix filled with lithium metal, and has a matrix cell size on the order of 1.5 microns [1]. The mass composition of CBLM is approximately 80% lithium and 20% boron. This material could potentially work as a capillary porous structure (CPS), with capillaries much smaller in size than those achievable in traditional CPS. Unlike traditional CPS, in which the matrix materials are heavy refractory metals (*eg.* molybdenum or tungsten), boron has a lower atomic number (Z = 4). This makes CBLM a promising material for plasma-facing components in thermonuclear facilities with magnetic plasma confinement.

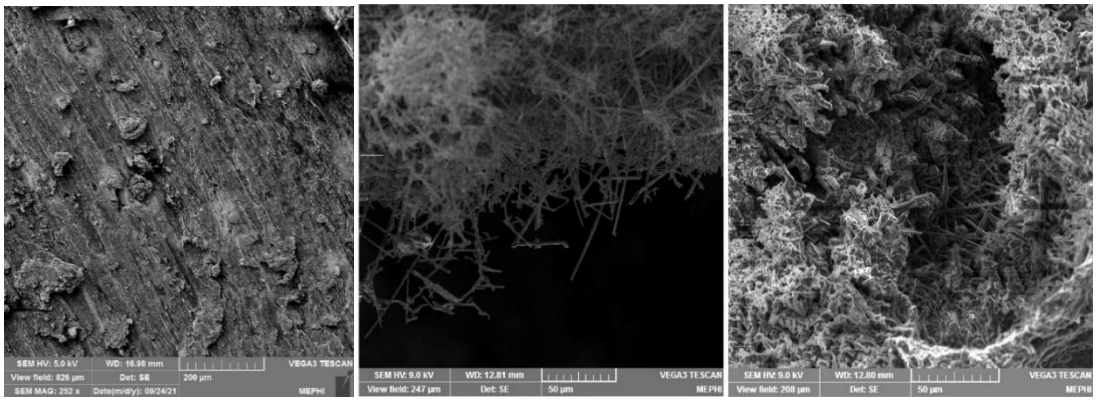

Fig.1. Micrographs of a K BLM sample filled with lithium metal, and after evaporation of the lithium in vacuum.

The first measurements of the dependence of the basic physical properties of CBLM on temperature, such as electrical conductivity and coefficient of thermal expansion were carried out. Studies on the structure and stability of CBLM to the effects of powerful thermal and ion plasma loads at the PR-2 facility have been conducted [2]. Samples of CBLM were subjected to electron beam and plasma irradiation, despite heating to >900°C, the CBLM maintained mechanical integrity. They also showed the properties of a CPS under the influence of high thermal loads. Though due to the influence of strong heat flows CBLM samples have undergone significant mechanical deformation.

It has been shown that electron beam irradiation does not lead to boron evaporation. However, in the case of helium plasma irradiation, boron is released, which is due to the insufficient effectiveness of the lithium protection. One possible reason for this is the lack of metal lithium within the matrix.

REFERENCES

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