THERMAL CONDUCTIVITY MEASUREMENTS OF ELECTROPLATED-NI/RVCF COMPOSITE TARGETS

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In order to avoid excessive losses through radioactive decay of short lived nuclei, highly permeable, thin-layered targets must be effected that will permit prompt diffusion-release and effusive transport of the release product to the ion source in a time period commensurate with the life-time of the species. Since these processes are exponentially dependent on the operational temperatures of the target matrix/ion source vapor-transport-system, the integrated system must be operated at temperatures as high as practical. Since the maximum temperature to which the target material can be operated depends on the vapor pressure characteristics of the target material, provisions must be made for removal of primary beam deposited heat from the target matrix during production. Thus, the idealized target will consist of a universal, low-density, highly-permeable matrix with good thermal management attributes that can be used for plating thin layers of the desired, refractory target material. Both reticulated-vitreous-carbon-fiber (RVCF) and carbon-bonded-carbon fiber (CBCF) matrices have these attributes and each has been employed for this purpose. Several techniques are available for controlled layer deposition of target materials including chemical vapor deposition, physical vapor deposition, and electroplating. During this reporting period, prototype Ni targets were fabricated by depositing thin layers (~ 5 – 16 (μm) of pure Ni metal onto ~ 16-mm diameter, 2 mm thick 1 x RVCF and 2 x RVCF (density, (0.12 g/cm2). The objectives of these studies were to measure the thermal conductivity of the composite system as a function of temperature for use in thermal transport calculations and to evaluate the release properties of the composite target-system for ^{58}Cu on-line at the UNISOR facility. Figure 1 displays scanning electron micrographs (SEMs) of a sample Ni deposit; the thermal conductivity attributes of the composite targets are shown, respectively, in Fig. 2. Targets made by this technique have been shown to efficiently release the isotopes of Cu during on-line tests at the UNISOR facility; the results of these studies have been reported in another contribution to this report.

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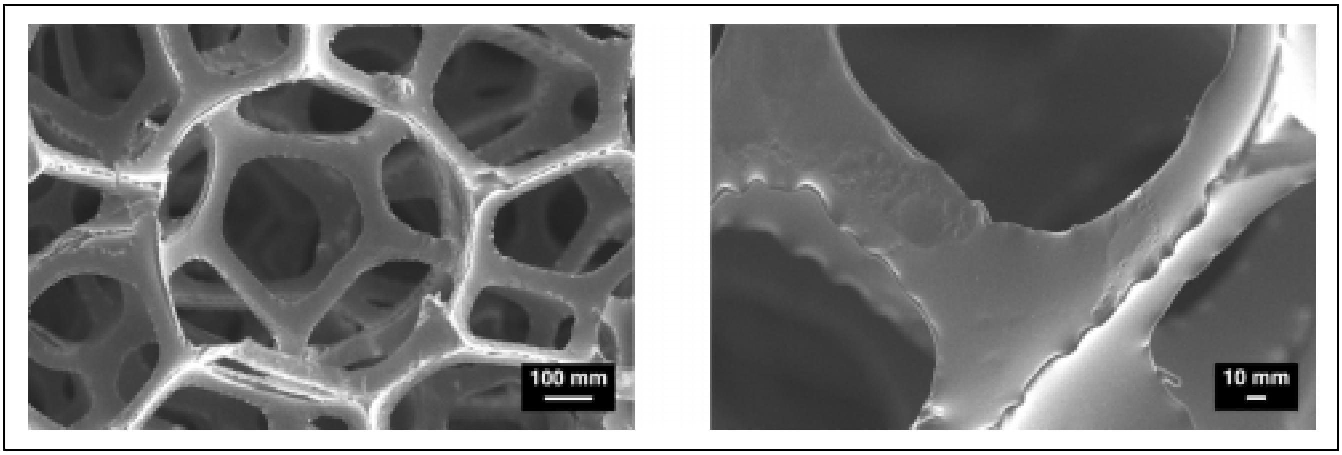
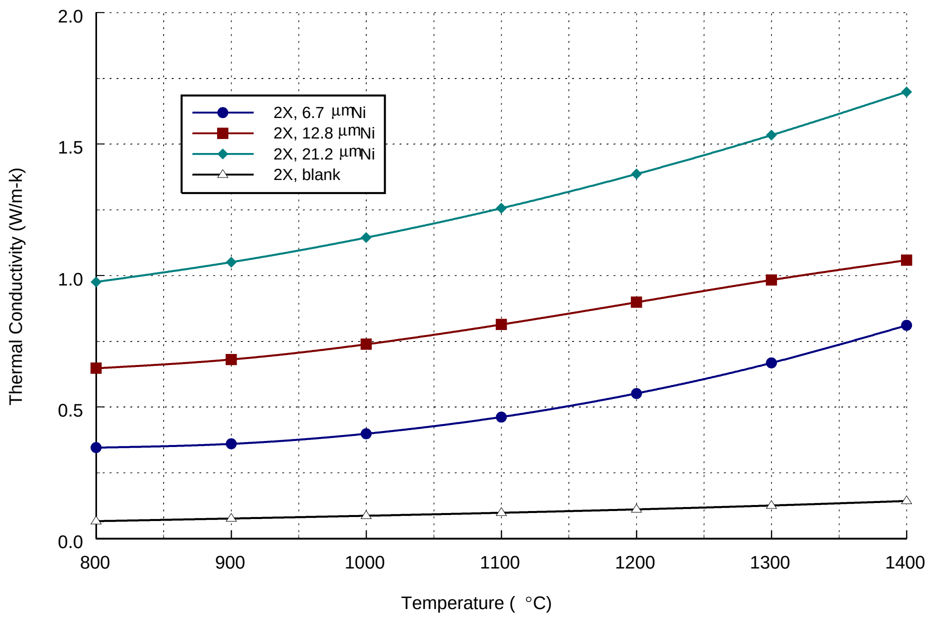


Fig. 1 ORNL-96M-7518. Scanning electron micro-graphs (SEMs) of highly permeable targets composed of RVCF electroplated with ~12 (μm of Ni metal for production and efficient release of ^{58}Cu. Targets made by this technique have demonstrated fast and efficient release of the isotopes of Cu during on-line tests at the UNISOR facility.



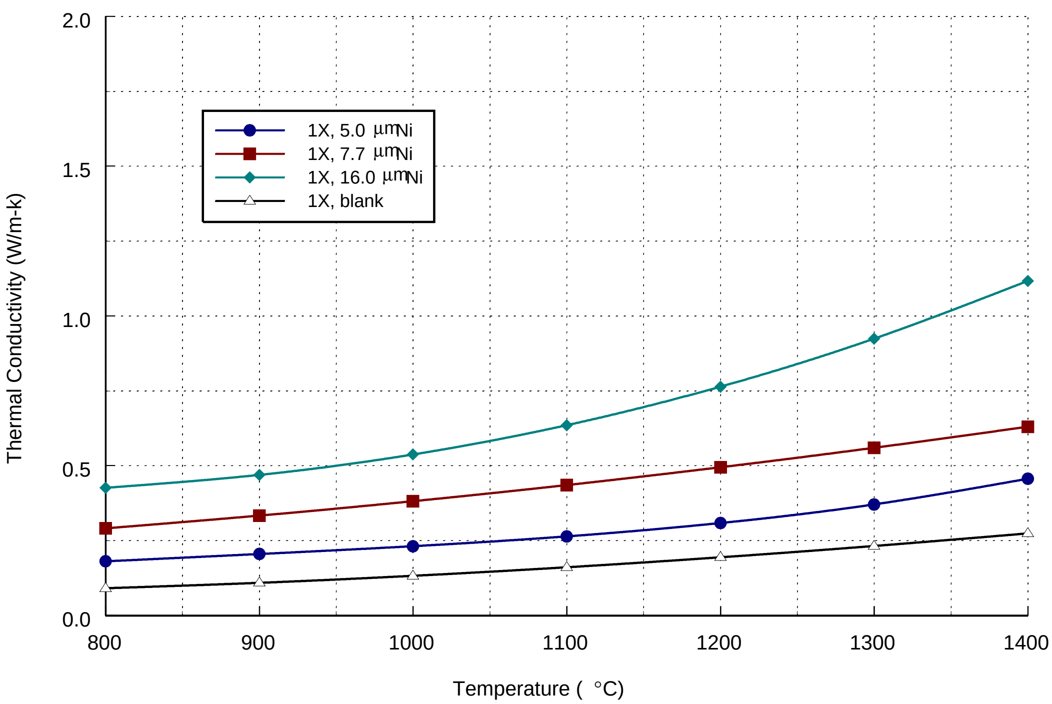


Fig. 2. Thermal conductivity versus temperature for ~ 16-mm diameter, 2-mm thick 1 x RVCF composite targets electroplated with various thicknesses of Ni metal.