# OPTIMIZING LASER PROCESSING MODE FOR NON-DESTRUCTIVE CRYSTALLIZATION OF SILICON COATING ON NANOFIBROUS NONWOVEN SUBSTRATE

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In this work, a two-layer structure (the lower layer is a-Si, the upper layer is Al) on a non-woven polyacrylonitrile substrate was studied. Square 2*2 mm2 sections of the sample were subjected to laser annealing at different beam scanning speeds and fixed laser power, repetition rate, and pulse duration. The annealed areas were studied using scanning electron microscopy and Raman spectroscopy.

The best crystallization of Si was observed during annealing at scanning speed range 1000 - 1300 mm/s. It was found that at speeds 1000 - 1200 mm/s, a significant amount of polyacrylonitrile nanofibers undergoes not only glass transition, but also decomposition, which indicates the achievement of a relatively high temperature during laser processing. On the remains of the fibers, peculiar “caps” and grains from a mixture of Si and incompletely ablated metal are formed. Presumably, many fibers become harder under the influence of temperature due to glass transition and break.

With an increase of scanning speed, the fluence decreases, and, accordingly, the thermal effect on the substrate also decreases. In this regard, the number of broken fibers and empty "caps" also decreases, but does not reach zero, since the temperature is probably still sufficient for the glass transition of polyacrylonitrile.

Thus, 1300 mm/s can be considered the most optimal scanning speed during annealing of two-layer structures on a polyacrylonitrile substrate. The use of this speed makes it possible to ensure not only the crystallization of Si, but also the integrity of the fibers of the nonwoven substrate.