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New laser furnace for the STRESS-SPEC instrument

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Current topics in materials research such as new production processes, e.g. additive manufacturing (AM), or sustainable energy research, e.g. high-temperature alloys, require a highly flexible sample positioning system during diffraction experiments. Therefore, the STRESS-SPEC group has pioneered the use of industrial robots for sample handling and positioning at neutron diffractometers [1, 2]. To fully exploit the capabilities of the robotic positioning system, a dedicated sample environment is essential. In this talk, we will present a recently developed lightweight laser furnace with a large neutron acceptance angle, which allows the investigation of samples at elevated temperatures up to 1100 ℃, while benefiting from the positioning flexibility of a 6-axis industrial robot. The furnace control rack was built with interoperability in mind, allowing to control various other sample environment devices as well. Some features and example use cases of the laser furnace will be presented.
Furthermore, we will also give an outlook at the future development of a lightweight mechanical tensile testing machine that can also be mounted on a 6-axis industrial robot.

[1] H.-G. Brokmeier et al., Mater. Sci. For. 652 (2010) pp. 197–201. DOI: 10.4028/www.scientific.net/MSF.652.197
[2] C. Randau et al., Nucl. Instr. Meth. A 794 (2015) pp. 67–75. DOI: 10.1016/j.nima.2015.05.014

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