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Design of the SLS-machine for PEEK

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Very interesting are the parts manufactured by the selective laser sintering (SLS) technology from some types of powders based on polyetheretherketone (PEEK). They have high strength values of up to 95 MPa (vs. 45 MPa for conventional polyamides) and Young's modulus of up to 4400 MPa (vs. 1500 MPa for conventional polyamides), have high heat resistance (maintenance of physical and mechanical properties during short-term exposure to temperatures up to 310 °C and long-term exposure to temperatures of 260°C), as well as excellent biocompatibility and insulating (dielectric) properties. A set of these properties in combination with the capabilities of the SLS method allows creating unique parts. These parts are increasingly used in the aerospace industry, medicine, and motorsport. We present the original design of the SLS facility (hereinafter referred to as SLS-machine), which uses PEEK. The SLS machine includes the following main units, systems and parts (Fig. 1): 1-lower transition table vertical drive, 2-lower transition table bracket; 3-lower transition table cooled rod; 4-lower transition table (has the ability to automatically engage with and disengage from the building platform); 5-building platform; 6-building platform heating system; 7-recoater; 8-double knife; 9-recoater drive; 10-airtight casing of recoater; 11-laser-optical unit; 12-laser-optical unit frame; 13-ring of laser-optical unit; 14-ZnSe-glass; 15-powder depositing main plate; 16-main plate frame; 17-main frame of the SLS machine; 18-airtight inner chamber; 19-top heaters; 20-pyrometer; 21-illumination lamp; 22-protective external chamber; 23-external chamber frame; 24-changeable frame; 25-changeable frame heating system; 26-changeable frame clamping device; 27-double-protective door; 28-left powder delivery hopper; 29-left powder delivery hopper clamping device; 30-right powder delivery hopper; 31-right powder delivery hopper clamping device; 32-left powder collection hopper; 33-left powder collection hopper clamping device; 34-right powder collection hopper; 35-right powder collection hopper clamping device; 36-air-gas system; 37-electric control device; 38-thermocouple.

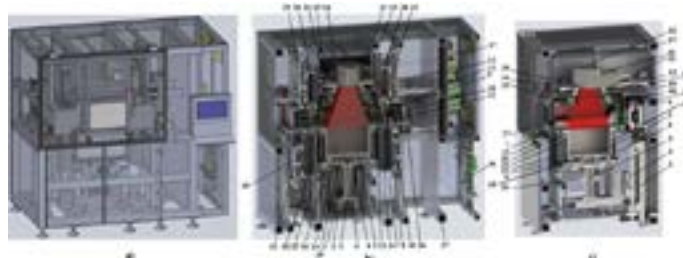


Figure 1: Design of the SLS machine (described in the text): a-general view, b-longitudinal section (axonometry), c-cross-section (axonometry)

Recent Publications:

1. EOS Plastic Materials for Additive Manufacturing. [online] Retrieved January 10, 2018, from <https://www.eos.info/material-p>
2. VICTREX™ PEEK Polymers. [online] Retrieved January 10, 2018, from https://www.victrex.com/~media/datasheets/victrex_tds_450g.ashx
3. PEEK (Polyarylethe-Retherketone). BPF. [online] Retrieved January 10, 2018, from <http://www.bpf.co.uk/plastipedia/polymers/peek.aspx>

Biography

Alexey Nazarov is the designer of SLS/SLM equipment, engineer of the Laboratory of Innovative Additive Technologies of MSTU "STANKIN", Moscow.

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