Experimental comparison between the different ranges of PLA feedstock 3D printing and their influence on the mechanical properties of printed parts.

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Abstract: Additive manufacturing processes are now increasingly used in industry. Among the various existing technologies, filament deposition (Fused Deposition Modeling), seems the most promising for the design of mechanical parts based on thermoplastic polymers. Parts made using the FDM technique are nowadays mainly high value-added parts, where the industrial sectors mainly concerned are: the medical world, the aeronautics and the automobile industry. A wide range of polymer feedstock exists in the 3D printing market as a raw material, where the microscopic structure is related to the processing conditions and the thermomechanical treatments performed during the manufacture of the filaments. In order to take into account the influence of the physical and chemical properties of the commercial polymer filaments, as well as the shaping conditions on the mechanical properties of the final part designed by FDM, an experimental comparison between three ranges of commercial PLA dedicated to the FDM method, in order to predict the final mechanical and microstructural properties of the parts designed by this method. The results of the analyzes: FTIR, DSC and tensile test; have shown a divergence in the mechanical and structural properties, which is maybe in direct relation with the choice of the raw material especially when the supplier does not give enough technical detail on the commercial raw material.

Keywords: 3D printing, naturel PLA feedstock, tensile strength.