

Chemical structure of the flexible material Vertex “ThermoSens”

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To the Editor,

We are writing to inform dental practitioners, technicians, and patients about the chemical composition of the thermoplastic polyamide denture base material, Vertex “ThermoSens”. This analysis was conducted as part of a PhD thesis on flexible dentures.

Understanding the chemical structure of Vertex “ThermoSens” is significant, as it determines the material’s mechanical and physical characteristics. The polyamide framework accounts for its combination of durability and elasticity, distinguishing it from earlier prosthetic materials. Such information provides insight into its practical applications and potential limitations within dental practice.

Despite multiple attempts, neither the manufacturer, Vertex Dental by 3D Systems, nor the primary importer in the country provided details about the material’s chemical composition.

Vertex “ThermoSens” represents a notable development in dental materials, classified within the polyamide group. This relatively recent addition to prosthetic options provides enhanced comfort and aesthetic qualities compared to traditional materials, offering an alternative for denture fabrication (1).

In order to analyze the structure of the material we contacted the Institute of Polymers at the Bulgarian Academy of Sciences (BAS) where a Fourier transform infrared spectroscopy was performed on a sample of the “ThermoSens” material.

Infrared spectroscopy is a powerful tool for identifying functional groups and analyzing chemical structures. It works by measuring the absorption of infrared light by different chemical bonds (3).

After performing the infrared spectroscopy on the thermoplastic polyamide granules “ThermoSens,” the following graphical image was obtained:

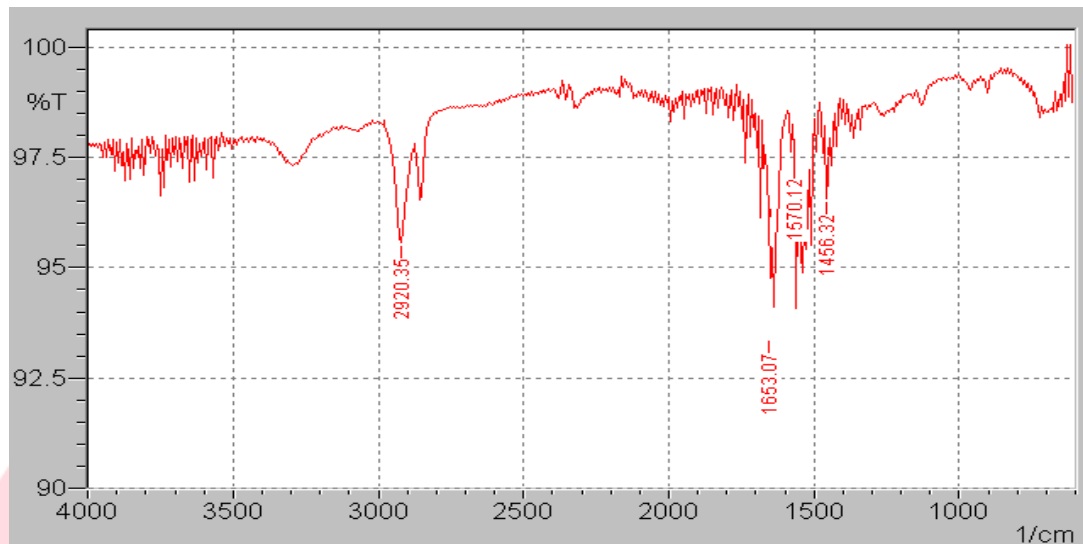


Figure 1: Infrared Spectrum of the "ThermoSens" Material

Figure 1 shows the IR spectrum of the sample. Characteristic bands for polyamide are observed: at 3295 cm^{-1} from NH, 2920 cm^{-1} from CH_2 , 1653 cm^{-1} from the amide-carbonyl group, and 1570 cm^{-1} due to amide II (NH). Based on the conducted study, it can be concluded that the "ThermoSens" material is polyamide-based, specifically polyamide 12 (PA12) (2, 4, 5).

The material's chemical composition, characterized by repeating amide linkages ($-\text{CONH}-$) within a polymer chain, defines its mechanical and physical properties. This polyamide structure contributes to its notable tensile strength and flexibility, enabling adaptation to oral contours while maintaining structural integrity. Research indicates that Vertex "ThermoSens" exhibits superior surface smoothness and impact resistance when compared to conventional heat-cured acrylics, attributes directly tied to its molecular arrangement.

This material is an example how advancements in polymer chemistry can influence dental prosthetic design. Its introduction merits consideration by those engaged in dental material science and clinical practice.

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