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Experimental Study of Microhardness and Wettability of Hard Multilayer Coatings of CR-39 Spectacle Lenses

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The presented research aimed to study the microhardness, wettability as well as the surface roughness of organic spectacle lenses for everyday use, based on CR-39 (Poly(allyl diglycol carbonate) (PADC).

The modern spectacle lens's organic materials [1], like CR-39, are superior to the old mineral lenses in many aspects, but their major vulnerability to scratches and chemical substances requests applying special protective surface coatings [1,2]. The most widely used are Hard Multilayer Coatings (HMC). These advanced protective coatings provide not only mechanical durability, dust, and dirt-resistant layers, but also allow modification and improvement of the optical properties like anti-reflectiveness, UV protection, color filters, etc. Although the optical properties of the spectacle lenses are widely studied [3] the data about their surface coatings' mechanical properties are insufficient [4]. Due to this fact, our research is focused on the experimental study of three parameters of the lens surface: microhardness, roughness, and wetting properties. CR-39 lenses, from different manufacturers, were selected for the purpose of the experiments. Each manufacturer was represented by one reference uncoated lens and other lenses with different functional types of protective coating. Each lens has been mechanically cut into multiple samples for easier characterization and better statistics. The microhardness, roughness, and wetting properties date sample.

The results of this study provide systematic data about the studied mechanical properties of the most commonly used CR-39 spectacle lenses from different quality rates, and correspondingly manufactured with different classes of protective optical coatings.

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