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Izvorni znanstveni članak

### Nonlinear mechanics of hyper elastic polyurethane furniture foams

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#### Sažetak

Upholstered furniture intended to provide better sleep and rest, especially furniture for disabled persons, require careful design of elastic spring systems. In the majority of cases, when designing new articles, both furniture designers and manufacturers rely on long-term experience and craftsman's intuition. On the other hand, the accumulated interdisciplinary knowledge of modern medical laboratories as well as furniture certification offices indicate that it is necessary to carry out investigations related to the mechanical properties of raw materials used to manufacture furniture and to conduct virtual modelling of the phenomena connected with the contact of the human body with the elastic base. The aim of this study was to determine the elastic properties of hyper-plastic polyurethane foams applied in furniture industry, to elaborate mathematical models of these materials on the basis of non-linear Mooney-Rivlin models and to conduct a non-linear numerical analysis of contact strains in a deformed seat made of polyurethane foam. The results of the experiments revealed that the mechanical properties of polyurethane foams are described properly by the Mooney-Rivlin model. Knowing the mechanical properties of these foams, it is possible to create freely complex furniture elastic systems. The state of strains in the contact of the human body with foam depends on the friction between these bodies. Therefore, in practice, it is advisable to design seat systems resulting in minimal frictions between the user's clothes and the furniture seat.

#### Ključne riječi

furniture design; hyperplastic polyurethane foam; nonlinear analysis

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