

## **The evaluation of influence of particle boards local strengthening in the area of pins set in furniture joints – rheological aspect**

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**Abstract:** *The evaluation of influence of particle boards local strengthening in the area of pins set in furniture joints – rheological aspect.* The occurrence of clear rheological phenomena in loaded modern furniture joints requires the necessity of their minimization [8, 11, 12]. One of the ways is a local modification of material properties of a particle board via application of PUR 555.6 nanopreparation into the area of pins screwing home. As far as quality is concerned rheological features of tested elements of furniture joints locally strengthened and traditional are similar [10, 12]. The paper shows a short evaluation of tests conducted on furniture joints of both kinds. The paper describes the influence of local strengthening on basic parameters of creep process such as: immediate deformation or creep speed in the second stage.

**Keywords:** creep, particle board, furniture joints, local strengthening, immediate deformation

### INTRODUCTION

In modern furniture constructions during assembly a wide range of different types of joint is used. They let relatively simple and fast furniture construction without the necessity of using special tools and technologies. These are undoubted advantages of modern furniture joints. Unfortunately they are not free from defects. They show low resistance and semi-rigid characteristics [2]. The causes of such disadvantageous phenomena are most of all materials of joined elements which are usually particle boards. They have anisotropic properties and low resistance parameters [6], moreover they show propensity to creep [4, 7]. Rheological phenomena are also clearly observed in joints which was among others proved in author's research [8, 10, 11, 12]. The improvement of disadvantageous properties is possible only by changing their construction features. It concerns particularly their geometrical and material features. The paper concentrates on evaluation of influence of change of joints' material features on their basic rheological parameters. This change is based on modification of particle board properties by PUR 555.6 nanopreparation in the assembly area of joints elements [8, 9, 10, 11, 12, 14]. The so far conducted research of this aspect of construction features changes of joints showed radical advantageous influence on load and stiffness of joints elements in pin pulling out tests [9, 14].

The main aim of the paper is comparison of basic rheological parameters for furniture joints elements which have changed and unchanged local areas in particle board under action of constant pulling force.

### THE COMPARISON OF CURVES AND PARAMETERS OF CREEP PROCESS

The creep process and more precisely the process depending on time pin moving under action of constant pulling out force was tested on universal testing machine type Tinius Olsen H5K-T. For specimens were used pins for screwing type Twinstart (Titus) with Euro screw-thread. PUR 555.6 was applied in pins wholes made in particle board. The loads used were of 327 N, 400N and 495 N. Both experiments and courses obtained on the basis of these experiments presented below are described in detail in papers [10, 12].

The creep curves described on Fig. 1a-c are concerned with first and partly second phase of creep [1, 3, 5, 10, 12, 13]. For loading 495 N was used curve having most favourable course and obtained from tests of not strengthened specimens. Because of technical problems

the time of tests was limited to 36 h for traditional samples and 60 h for strengthened samples [10, 11, 12].

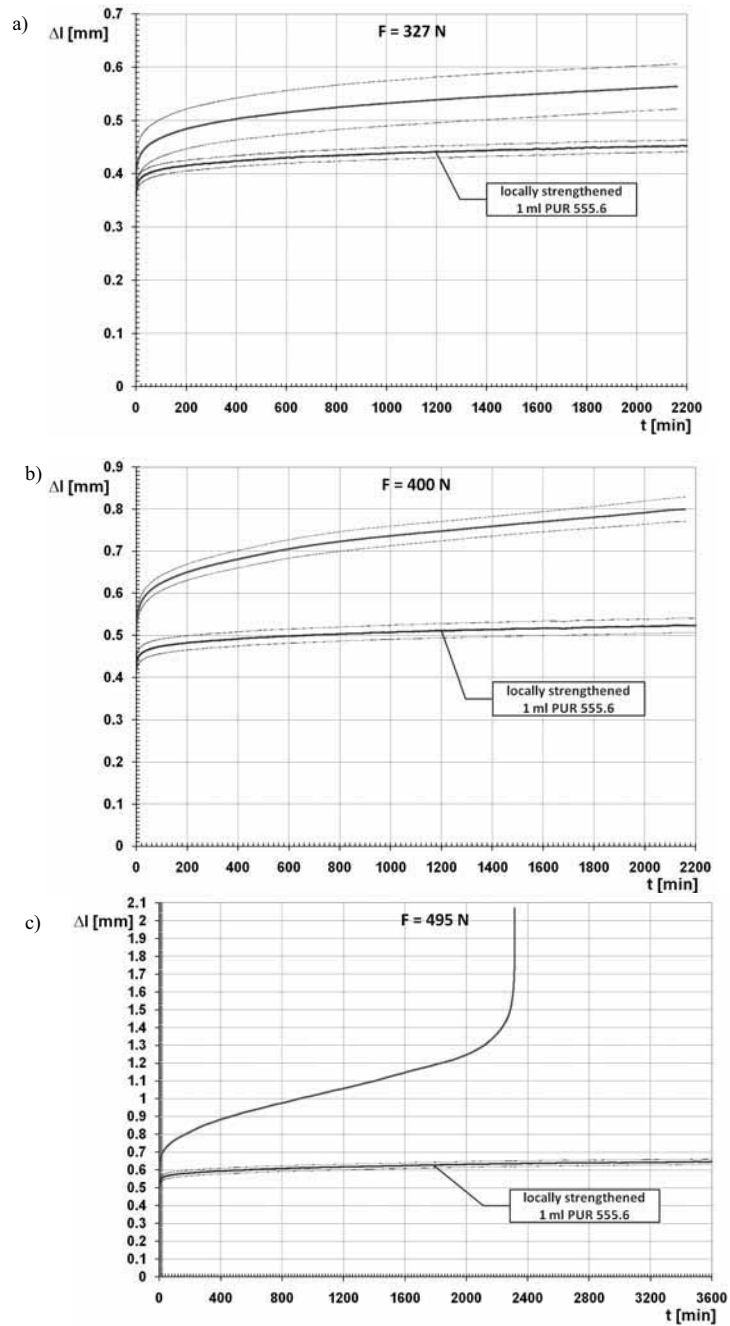


Fig 1. Creep curves for constant load: (a) 327 N; (b) 400 N, (c) 495 N

The comparison of immediate deformation and average speed in the second creeping phase between 32 and 36h of measurement was also conducted (Fig 2).

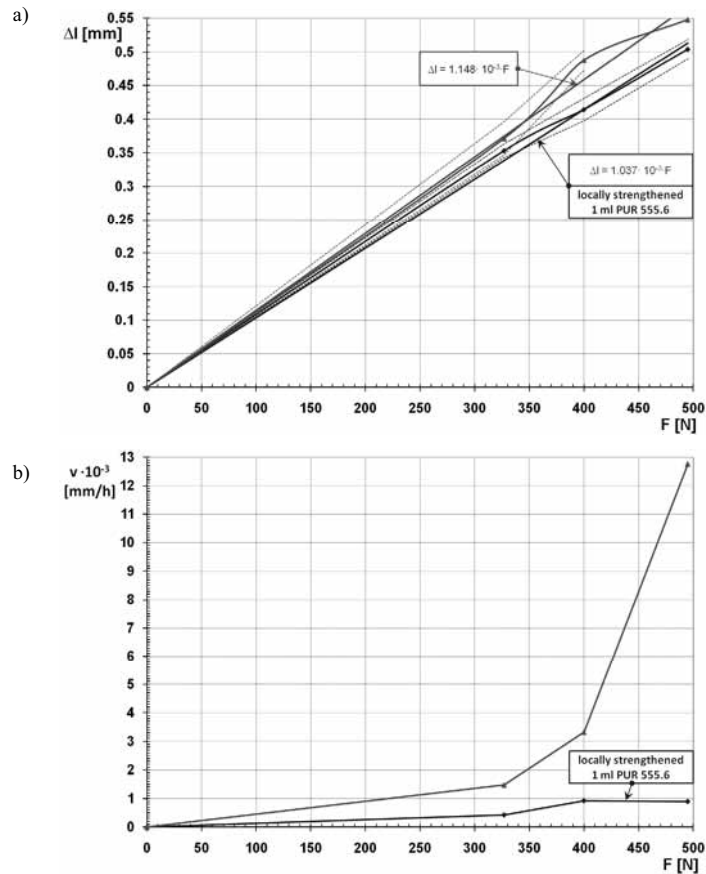


Fig 2. (a) dependence of immediate moving from load, (b) dependence of average creep speed (between 32 and 36 hour of tests) from load

## CONCLUSIONS

The conducted comparison of basic parameters of creep process in tested elements of joints shows clearly advantageous influence of process of local strengthening. One can observe shorter time of transient creep (Fig. 1), but it is difficult to be described quantitatively because of conventionality of beginning of second phase of creep [5]. Moreover immediate deformations are decreasing but in much smaller degree from average speed in steady creep state. Insignificant influence on degree of immediate deformation is connected with the change of stiffness as a result of local strengthening [9].

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**Streszczenie:** *Ocena wpływu lokalnego wzmocnienia płyt wiórowych w obszarze osadzania trzpieni połączeń meblowych w aspekcie reologicznym.* Występowanie wyraźnych zjawisk reologicznych w obciążonych nowoczesnych połączeniach meblowych wprowadza konieczność ich minimalizacji [8, 11, 12]. Jednym ze sposobów jest lokalna modyfikacja właściwości materiałowych płyty wiórowej poprzez aplikację nanopreparatu PUR 555.6 w obszar wkręcania trzpieni. Pod względem jakościowym cechy reologiczne badanych elementów połączeń meblowych lokalnie wzmocnionych i tradycyjnych są podobne [10, 12]. W pracy dokonano krótkiego podsumowania badań elementów połączeń obu rodzajów. Przedstawiono wpływ zabiegu lokalnego wzmocniania na podstawowe parametry procesu pełzania takie jak: odkształcenie natychmiastowe czy prędkość pełzania w drugim stadium.

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