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# Estimate of the fourth-rank shear modulus in metallic glasses

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**Abstract**

On the basis of the Interstitialcy theory, a method to calculate the fourth-rank shear modulus is suggested and verified. The estimates of this modulus for a number of metallic glasses are given.

*Keywords:* Metallic glasses, Interstitialcy theory, fourth-rank shear modulus, shear susceptibility, structural relaxation

## 1. Introduction

Metallic glasses, due to a number of their specific physical properties, constitute a promising class of functional materials [1]. A very high elastic limit $\sigma_{el}$ is one of their most important characteristics. At room temperature, $\sigma_{el} \approx 0.02\,E$ ($E$ is the Young's modulus) that corresponds to the absolute values of $\sigma_{el} \approx 2-3$ GPa for most metallic glasses, comparable to the strength of the strongest crystalline metallic materials [2–4]. It has been firmly found that a description of the mechanical properties of metallic glasses at such high stresses needs to account for the effects of non-linear elasticity [5–7]. In general, the understanding that non-linear effects occurring due to the anharmonicity of the interatomic potential are manifested in many properties of metallic glasses has now been increasing [3, 8–15]. The knowledge of non-linear (anharmonic) elastic moduli should give important information

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