



# Storage modulus of porous materials

A relationship between porosity and Young's modulus is obtained theoretically for porous materials made by powder metallurgy. The relationship is applicable to the entire range of porosity and is capable of treating the transition of pore structure from interconnected to isolated. The exact solution is presented graphically. An approximate solution with a wide applicable porosity ...

The present study aims to develop a systematic processing route using direct ink writing (DIW) and pressureless sintering for fabricating hierarchically porous  $\text{Cu}$  (HP-  $\text{Cu}$ ) electrodes. A 3D printable high particle loading  $\text{Cu}$  ink  $\geq 95$  {text{wt}}}%  $\geq 95$  wt % with polylactic acid as a binder was prepared. Green ...

Plastic pollution poses a significant environmental challenge, necessitating the investigation of bioplastics with reduced end-of-life impact. This study systematically characterizes four promising bioplastics--polybutylene ...

Progress in predicting the elastic properties of porous materials over an entire porosity range has been closely related to the power-law empirical relationship of Phani and Niyogi:  $E = E_0 \cdot \dots$

Focus has been mainly on the description and prediction of the porosity-dependent mechanical properties such as effective strength, elastic modulus and shear ...

Fluid-saturated rocks are multi-phasic materials and the mechanics of partitioning the externally applied stresses between the porous skeleton of the rock and the interstitial fluids ...

1 Introduction Lithium-ion batteries (LIBs) are ubiquitous in our daily life, from portable electronic devices to electric vehicles or plug-in hybrid electric vehicles. [1-6] Although the energy density of LIBs has steadily increased during the past decades, the practical energy density is close to its theoretical value and has hardly been further improved.

The AlSi30 p /5052Al composite with porous particle layer was successfully produced by hot rolling. Numerous interparticle interfaces and pores were seen in the particle ...

Herein, we prepared 3D-networked porous carbon materials (TNPCs) (porosity  $\approx 70\%$ , average pore size  $\approx 10$  nm, density  $\approx 0.37$  g  $\text{cm}^{-3}$ ) composed of glassy carbon via pyrolysis of porous phenolic precursors. A compressive test for TNPCs shows that the Young's moduli and compressive strength of TNPCs ranged from 0.7 to 1.5 GPa and 11 to 30 MPa, respectively, ...

A relationship between porosity and Young's modulus is obtained theoretically for porous materials made by powder metallurgy. The relationship is applicable to the entire range of ...



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By semi-analytical modifications to Mackenzie's equation, a new third-order relation between bulk modulus and porosity is developed for porous materials. Compared with Mackenzie's equation, the pro... References Breeding, S. K. and Lavoie, D. [1988] " Duomorph sensing for laboratory measurement of shear modulus," in Oceans '88.

Even though porous systems exhibited lower storage modulus in comparison with the solid ones, ... Furthermore, the porous materials under investigation also exhibit lower hysteresis than non-porous magnetic elastomers. Acknowledgments The authors wish ...

Three-dimensional reconstructions 3D models of the SBE are reconstructed as illustrated in Fig. 1a. High-resolution micrographs of the SBE were first obtained from FIB-SEM as illustrated in Fig. 1b

We present an extension of a multiscale micromorphic theory to three-dimensional problems for porous materials, where a clear scale separation is not given. Following the multiscale micromorphic framework of Biswas and Poh (J Mech Phys Solids 102:187-208, 2017), macroscopic governing equations of a micromorphic continuum are derived from a ...

Geng and others published Superior Impact Toughness and Excellent Storage Modulus of ... of two methods for the formation of porous polymeric materials. A treatment procedure using supercritical ...

In the previous section, we derived the yield criterion of porous materials by using homogenization approach and Steigmann-Ogden surface model. The yield criterion is analytical and implicit ...

High storage modulus signifies the shape-retaining property of parts and very thin porous (Cu) electrodes having extremely fine pores can be 3D printed using the same. Thin (Cu) porous electrodes having extremely fine pores for lithium metal batteries result in achieving high coulombic efficiency thereby yielding higher battery performance [ 30 ].

1400 1200 1000 ~ .a !:: BOO &quot; ... &quot; Co SOO E f-&quot; 400 200 0 0 100 200 300 400 soo SOO Time (min) Fig2 Time dependent temperature for heat-treatment The first, calculated the appropriate ratio of raw materials according to design the porosity, requirement

Porous materials possess advantages such as rich pore structures, a large surface area, low relative density, high specific strength, and good breathability. They have broad prospects in the development of a high ...

As 4 wt. % [email protected] is dispersed in the polymer matrix, the loss factor (ratio of loss modulus to storage modulus) of the composite is above 0.09, and the maximum value can reach 0.156 ...

Introduction Hydrogen is an attractive, potentially carbon-free energy carrier that is widely expected to play a significant role in a post-fossil fuel global economy. It has an exceptional gravimetric energy density (with a higher heating value of 142 MJ kg<sup>-1</sup>) and is abundantly available from water and biomass, but its low



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volumetric energy density at ambient conditions ...

Graphene, 2D atomic-layer of sp<sup>2</sup> carbon, has attracted a great deal of interest for use in solar cells, LEDs, electronic skin, touchscreens, energy storage devices, and microelectronics. This is due to excellent properties of graphene, such as a high theoretical surface area, electrical conductivity, and mechanical strength. The fundamental structure of ...

The porous fluid storage medium is a solid-liquid biphasic complex inspired by biological articular cartilage, which can self-compensate for lubrication by precipitating fluid ...

This suggests that much of the dispersion of the storage Young's modulus of the saturated sample with viscosity is strongly linked to that of the fluid dynamic shear modulus. Again, the modeled  $E'$  is also slightly lower than the analytic predictions of CPA while both comfortably reside within the Hashin-Shtrikman lower and upper bounds.

The study results show that (1) irregular versus regular pore distribution has a significant effect on the effective Young's modulus of porous materials, particularly at high ...

Lucie Rouleau, Alain Guinault and Jean-François Deu  
10-1 100 101 Frequency [Hz] 103 104 105 Storage and loss moduli [Pa] Melamine foam - Storage and loss modulus Sample 1 - T=-10°C Sample 2 - T=-10°C Sample 5 - T=-10°C Sample 1 - T=0°C Sample 2 ...

By semi-analytical modifications to Mackenzie's equation, a new third-order relation between bulk modulus and porosity is developed for porous materials. Compared with Mackenzie's equation, ...

Porous materials contain regions of empty space into which guest molecules can be selectively adsorbed and sometimes chemically transformed. This has made them useful in ...

(A) SEM images of samples with 33 and 73 vol % porosity. (B) Illustration of a porous material and FE analysis with representative closed-and open-cell RVEs. (C) Stress-strain curves of ASTM ...

In addition, the proposed equation can describe the bulk modulus of porous materials with critical porosity well. However, Mackenzie's equation cannot work. Discover the world's research

Hydrogels are soft materials that consist of physically or chemically cross-linked polymer networks and a large quantity of water. Hydrogels have a high water content and low elastic modulus (~100 ...

PDF | On Jan 1, 1969, Arnold Verruijt published Elastic Storage of Aquifers, in: Flow through Porous Media (R.J.M. De Wiest, editor), Academic Press, New York, 1969 ...

Metal-organic frameworks (MOFs), representing a novel class of porous materials, feature unique pore



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structure, such as exceptional porosity, tunable pore structures, ...

Conventional analytical formulas for predicting the effective Young's modulus of porous materials often rely on simplifying assumptions and do not explicitly incorporate microstructural information. This study investigates the impact of regular versus irregular pore distributions on the stiffness of porous materials using microstructure-free finite element ...

Highly crosslinked elastic semi-IPN followed the storage modulus of PMMA after the glass transition as a result of certain degree of phase mixing and interlocked structure. It was shown that the morphology of the porous polymer network could be easily controlled by the proper choice of concentration and composition of crosslinking agent.

According to the review by Liu et al., [12], porous materials for making composite PCM can be categorized into four groups: organic polymer materials, including polyethylene terephthalate, polymethyl methacrylate, polyaniline, and high-density polyethylene 2,, .

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