Nanobare cu elemente disipative

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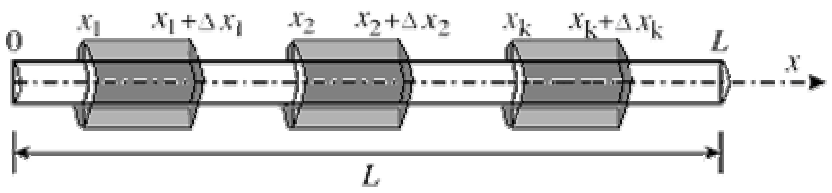

Nanobara cu elemente externe disipative

$$\frac{\partial}{\partial x^2}\left(J(x)\frac{\partial^2 w}{\partial x^2}\right)+\rho A\left(\frac{\partial w}{\partial t}\right)^2+\Upsilon=0 \qquad \Upsilon=\sum_{i=1}^{k}\int_{x_i}^{x_i+\Delta x_i}\int_{-\infty}^{t}C(x,\xi,t-\tau)\frac{\partial w(\xi,\tau)}{\partial t}d\tau d\xi.$$

$$C(x,\xi,t-\tau)=H(x)c(x-\xi)g(t-\tau). \qquad C(x,\xi,t-\tau)=H(x)c(x-\xi)\delta(t-\tau).$$

$$c(x-\xi)=\frac{\alpha}{2}\exp(-\alpha\,|x-\xi|), \qquad c(x-\xi)=\frac{\alpha}{\sqrt{2\pi}}\exp\left(-\frac{1}{2}\alpha^2(x-\xi)^2\right).$$

Histerezis temporal

$$C(x,\xi,t-\tau)=H(x)\delta(x-\xi)g(t-\tau).$$

$$g(t-\tau)=g_0\mu\exp(-\mu(t-\tau))$$

Histerezis spatial

$$C(x,\xi,t-\tau)=H(x)c(x-\xi)\delta(t-\tau).$$

$$c(x-\xi)=\frac{\alpha}{2}\exp(-\alpha\,|x-\xi|),$$

$$c(x-\xi)=\frac{\alpha}{\sqrt{2\pi}}\exp\left(-\frac{1}{2}\alpha^2(x-\xi)^2\right).$$

TABEL 1
Primele frecvente proprii pentru o nanobara simplu rezemata cu un element HDPE.

Model	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5
Caz 1					
1	-4.74±20.15i	-0.26±71.42i	-0.045±160.98i	-0.017±287.31i	-0.0050±451.67i
2	-4.91±20.22i	-0.29±71.66i	-0.051±160.53i	-0.019±287.76i	-0.0051±451.71i
3	-4.75±20.16i	-0.23±71.09i	-0.038±160.51i	-0.013±287.98i	-0.0011±451.70i
4	-4.43±20.39i	-0.15±71.10i	-0.028±160.04i	-0.008±287.06i	-0.0012±451.74i
Caz 2					
1	-9.97±16.99i	-3.79±72.44i	-3.03±152.66i	-3.57±283.21i	-2.59±449.83i
2	-10.52±16.94i	-4.28±72.44i	-3.32±152.77i	-4.04±283.23i	-2.64±449.47i
3	-10.05±16.84i	-3.36±72.48i	-2.51±152.76i	-2.73±283.21i	-0.66±449.74i
4	-9.12±16.87i	-2.28±72.59i	-1.89±152.58i	-1.76±283.29i	-0.60±449.82i
Caz 3					
1	-3.38±18.19i	-1.17±60.46i	-1.13±144.28i	-0.33±165.45i	-0.059±346.03i
2	-3.52±18.24i	-1.28±60.58i	-1.19±144.58i	-0.48±165.47i	-0.064±346.47i
3	-2.15±18.11i	-1.09±60.39i	-1.11±144.92i	-0.13±165.83i	-0.066±346.74i
4	-2.12±18.24i	-0.67±60.49i	-1.10±144.75i	-0.12±165.59i	-0.060±346.82i

TABEL 2
Primele frecvente proprii pentru o nanobara simplu rezemata cu doua elemente HDPE.

Model	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5
Caz 1					
1	-4.82±14.57i	-0.32±63.51i	-0.046±143.56i	-0.018±280.38i	-0.0052±413.33
2	-4.90±14.99i	-0.39±63.60i	-0.053±143.63i	-0.019±280.42i	-0.0054±413.37
3	-4.91±14.60i	-0.33±63.32i	-0.039±143.90i	-0.015±280.33i	-0.0013±413.11
4	-4.65±13.86i	-0.27±63.19i	-0.029±143.42i	-0.009±280.25i	-0.0012±413.30
Caz 2					
1	-10.07±15.09i	-3.99±70.54i	-3.05±142.46i	-2.58±279.06i	-2.60±423.03i
2	-10.76±15.22i	-4.77±70.55i	-3.39±142.45i	-3.17±279.00i	-2.65±423.22i
3	-10.35±15.13i	-3.66±70.68i	-2.57±142.77i	-2.25±279.12i	-0.67±423.31i
4	-9.48±15.53i	-2.58±70.68i	-1.91±142.78i	-1.67±279.04i	-0.65±423.30i
Caz 3					
1	-3.41±10.63i	-1.19±55.26i	-1.17±140.56i	-0.37±250.58i	-0.077±417.24i
2	-3.59±10.92i	-1.33±55.56i	-1.22±140.85i	-0.51±250.37i	-0.079±417.38i
3	-2.33±10.76i	-1.22±55.55i	-1.20±140.92i	-0.33±250.71i	-0.071±417.76i
4	-2.23±10.45i	-0.79±55.43i	-0.49±140.75i	-0.32±250.54i	-0.070±417.77i

TABEL 3
Locatie elemente externe disipative HDPE (caz 1, model 1).

	Mode 1	Mode 2	Mode 3	Mode 4	Mode 5
$k_p=1$					
	-5.87±744.55i	-4.96±1493.49i	-3.24±1873.57i	-2.77±2637.39i	-0.52±3553.46i
x_1	0.5	0.5	0.23 and 0.67	0.155 and 0.745	0.11 and 0.79
$k_p=2$					
	-5.22±699.32i	-4.93±1292.42i	-3.87±2073.57i	-2.59±2537.50i	-2.52±3053.60i
x_1	0.055 and 0.845	0.09 and 0.81	0.235 and 0.665	0.15 and 0.75	0.11 and 0.79
x_2	0.105 and 0.795	0.125 and 0.775	0.275 and 0.625	0.285 and 0.615	0.21 and 0.69

Şt.Donescu, V.Chiroiu, L.Munteanu, *On the Young's modulus of a auxetic composite Structure*, Mechanics Research Communications, 36, 3, 294-301, 2009.
L.Munteanu, D.Dumitriu, Şt.Donescu, V.Chiroiu, *On the complexity of the auxetic systems*, Sect.15, Ch.1, Proceedings of the European Computing Conference, vol.2 (Eds. N.Mastorakis, V.Mladenov),1543-1549, Ed. Springer, 2009.
P.P.Teodorescu, V.Chiroiu, *On the nonlocal damping*, Buletin Stiintific, Seria Mecanica Aplicata, Pitesti, 1, 14, 243-250, 2007.

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