

**Electronic Supplementary Information for**

**Anisotropy effects on the time-resolved spectroscopy of the acoustic vibrations  
of nanoobjects**

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**Contents:**

- + Fig. S1: Displacement fields of vibrational eigenmodes in a crossing region
- + Fig. S2: Effects of crystallinity on the breathing and quadrupolar modes of silver nanospheres
- + Fig. S3: Effects of crystallinity on the breathing and quadrupolar modes of zinc nanospheres.

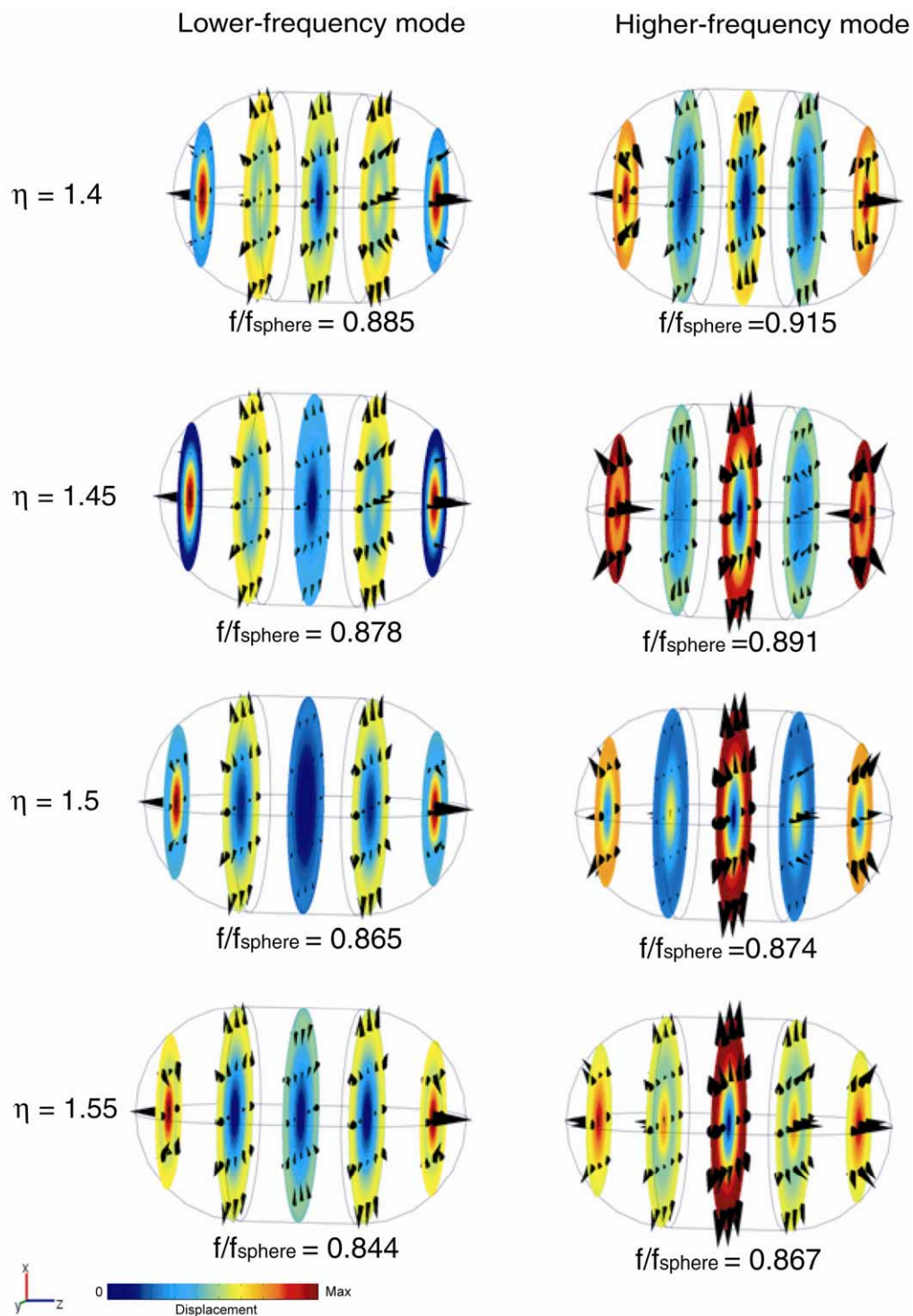


Fig. S1: Displacement fields of vibrational eigenmodes in a crossing region. This figure presents the displacement fields associated to the two modes discussed in Fig. 2c-d (normalized frequencies are also indicated). Outside the crossing regions, one of these modes is clearly “breathing-like” and involves a general expansion of the particle in all directions ( $\eta = 1.4$ , left and  $\eta = 1.55$ , right). On the contrary, in the crossing region ( $\eta = 1.45$ -1.5) a strong coupling occurs between the two crossing modes, so that none of the eigenmodes keeps a pure breathing-like character.

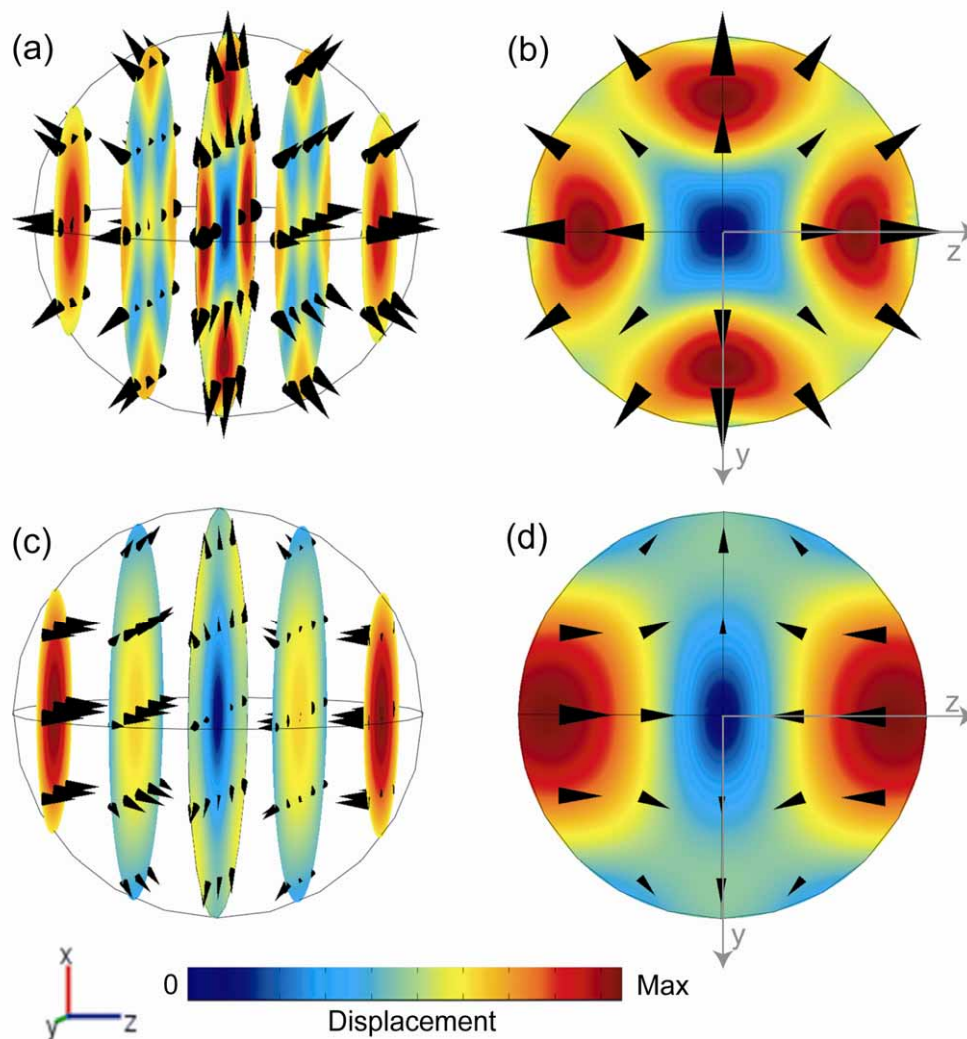


Fig. S2. Effects of crystallinity on the breathing and quadrupolar modes of silver nanospheres.

(a-b) Fundamental breathing mode: (a) three-dimensional view and (b) displacement in an equatorial plane (to be compared with Fig. 1a). (c-d) ( $l = 2, m = 0$ ) quadrupolar mode: (c) three-dimensional view and (d) displacement in an equatorial plane (to be compared with Fig. 1b).

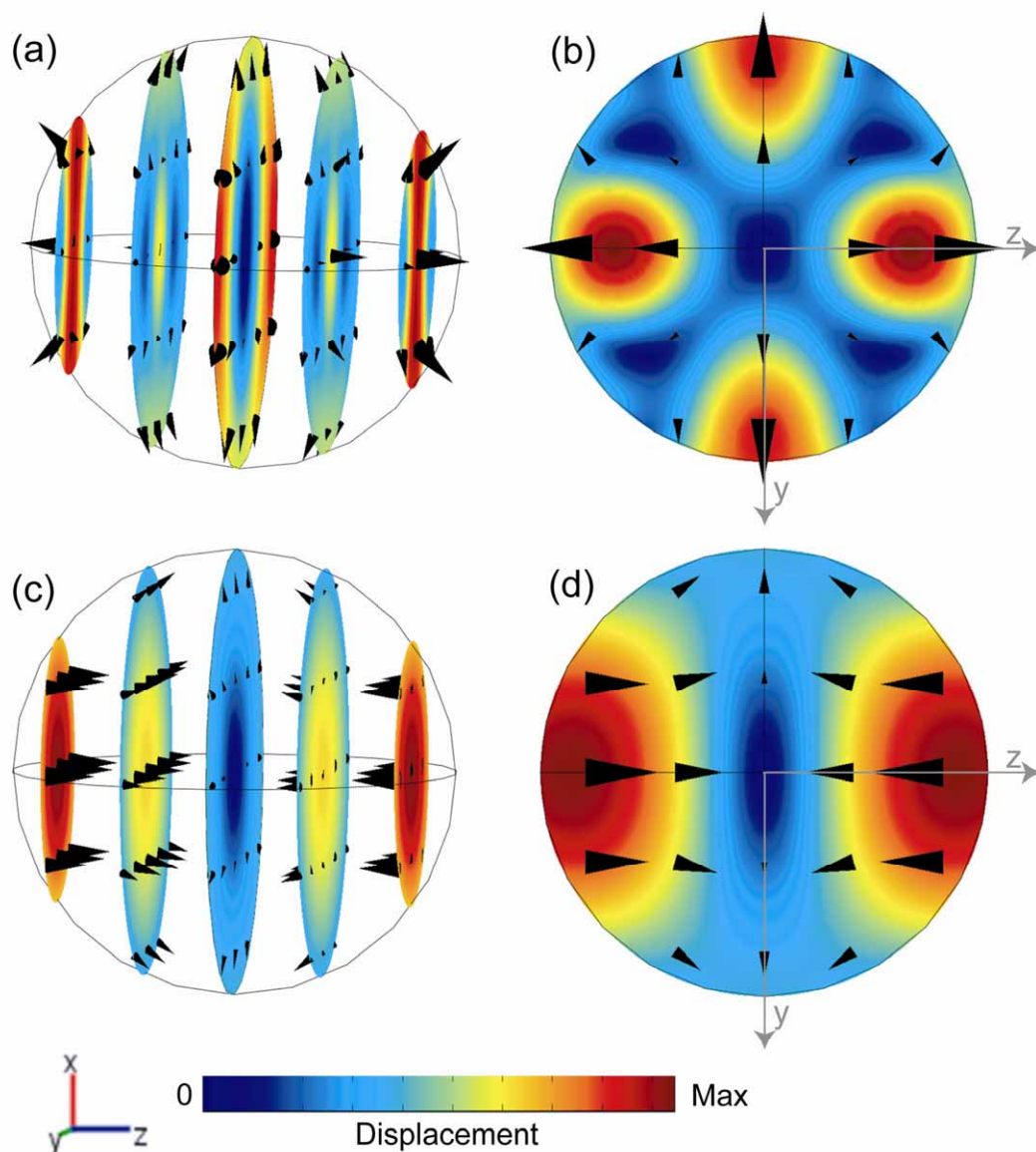


Fig. S3. Effects of crystallinity on the breathing and quadrupolar modes of zinc nanospheres.

Note that, contrary to cubic crystals, the three orthogonal axes used to define the elasticity matrix are not equivalent anymore for hexagonal crystals: the horizontal axis (z-axis) has different elastic properties from the two others (x and y). (a-b) Fundamental breathing mode: (a) three-dimensional view and (b) displacement in an equatorial plane. (c-d) ( $l = 2, m = 0$ ) quadrupolar mode.