Supplementary Materials:

S1: Numerical model setup for anisotropic medium:

Considering a linear elastic material, the constitutive equations can be expressed in terms of generalized Hooke's law as follows:

$$\boldsymbol{\sigma_{ij} = C_{ijkl}\varepsilon_{kl}} \qquad \boldsymbol{i,j,k,l = 1,2,3} \tag{1}$$

where $\boldsymbol{\sigma_{ij}}$ and $\boldsymbol{\varepsilon_{kl}}$ are the components of the stress and strain tensors and $\boldsymbol{C_{ijkl}}$ are the elements of the fourth-order elastic tensor which has 81components; in the case of isotropic materials, this number is reduced to 2 and the elastic tensor can be expressed as:

$$\boldsymbol{C_{ijkl} = \lambda\delta_{ij}\delta_{kl} + \mu(\delta_{ik}\delta_{jl} + \delta_{il}\delta_{jk})} \tag{2}$$

where $\boldsymbol{\mu}$ and $\boldsymbol{\lambda}$ are the Lame's constants and $\boldsymbol{\delta_{ij}}$ is the Kronecker's delta. Using Voigt notation, the elastic tensor can be expressed as a $\boldsymbol{6 \times 6}$ matrix (e.g., Mavko et al., 2020):

$$[\boldsymbol{C}] = \begin{bmatrix} \boldsymbol{2\mu+\lambda} & \boldsymbol{\lambda} & \boldsymbol{\lambda} & \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{0} \\ \boldsymbol{\lambda} & \boldsymbol{2\mu+\lambda} & \boldsymbol{\lambda} & \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{0} \\ \boldsymbol{\lambda} & \boldsymbol{\lambda} & \boldsymbol{2\mu+\lambda} & \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{0} \\ \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{\mu} & \boldsymbol{0} & \boldsymbol{0} \\ \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{\mu} & \boldsymbol{0} \\ \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{0} & \boldsymbol{\mu} \end{bmatrix} \tag{3}$$

The components of this matrix are stiffness components in which $\boldsymbol{2\mu+\lambda}$ is $\boldsymbol{C_{11} = C_{22} = C_{33}}$, $\boldsymbol{\lambda}$ is $\boldsymbol{C_{12} = C_{23} = C_{23}}$ and $\boldsymbol{\mu}$ is $\boldsymbol{C_{44} = C_{55} = C_{66}}$ for isotropic material, and these values are related to the speed of pressure and shear waves in the domain as follows:

$$\boldsymbol{V_p = \sqrt{\frac{C11}{\rho}}} \tag{4}$$

$$\boldsymbol{V_s = \sqrt{\frac{C44}{\rho}}} \tag{5}$$

where V_p and V_s are the speeds of pressure and shear waves. Such a model can be used for numerically model dynamic wave propagation in anisotropic materials with 1) extrinsic source of anisotropy such as existing poly materials and micro-cracks and 2) intrinsic source of anisotropy such as crystallographic preferred orientations. A numerical tool has been developed on COMSOL multi-physics, which provides a concrete framework to implement the above formulation by the finite element method. For this purpose, "solid mechanics" or "wave propagation" modules of the software can be employed.