A macroscopic criterion of shakedown limit for ductile porous materials subjected to general cyclic loadings

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Highlights

- A macroscopic criterion is analytically derived to determine the shakedown domain for ductile porous media with von Mises matrix under repeated loads by the use of Melan's theorem;
- This approach is generalized for all possible intermediate cyclic loading cases ranging between the extreme cases with the choice of a more appropriate trial residual stress field;
- The new analytical criterion, depends on the first and second macroscopic stresses invariants and the sign of the third one;
- The established criterion is accessed by both shakedown direct method and incremental elastic plastic simulations;
- The relationship between the elastic limit and the amplitude of cyclic shakedown limit load is derived.