

## **Principal direction paths in tension-torsion test at finite strain**

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**Abstract:** General equations are presented for the determination of principal direction paths of each of the Lagrangian strain ellipsoid, Eulerian strain ellipsoid, strain rate, and Cauchy stress for uniform finite deformation of thin-walled tubes in combined tension and torsion. Specific paths are evaluated from experimental results for nonproportional loading of tubes of annealed copper (Bell and Khan 1980) and mild steel (Bell 1983a). It is found that the principal directions of Cauchy stress are not correlated with either of the strain ellipsoids, but that Cauchy stress and Eulerian strain rate are very nearly coaxial throughout the moderate finite-deformation range of the experiments.