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Toward the optimization of the ballast gluing process for track resistance lateral enhancement

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Microscopic scale (grain)

- Characterization of glued contact in traction
- Grain surfaces conserved
- Controlled contact typology (point/face, edge/face and face/face contacts)
- Minimum of 15 repetitions

Main conclusions :

- Tensile strength depends on adhesive surface contact
- Contact topology influences tensile strength
- Displacement at maximum tensile strength independant of glued surface

Interaction law A Maugis-Dugdale model

γ cohesive force
 g contact gap
 r_n normal contact force
 $g \geq 0, \quad r_n + \gamma = 0$
 $g \cdot (r_n + \gamma) = 0$

Mesoscopic scale (REV)

Glue repartition ? Glue bound volume ?

Gluing experiment :

- Box dimension : 40x60x60 cm
- Ballast density : 1543 kg.m⁻³
- Glue quantity : 1,25 L.m⁻²

Main conclusions :

- Number of glued grains decrease with depth
- Volume of glued contact independant of its position

Macroscopic scale (Railway section)

lateral resistance tests

Experimental Part Numerical Part

Gluing Configurations

Main conclusions :

- Numerical model requires ajustements
- Similar tendencies