

Meet the Winners of the 2nd Grow/Harvest Call

Construction + Recycling & Circular Economy

MoRe R&C

Mortars with Recycled Rubber & Carbon

Consortium



Politecnico
di Torino



ITALY



Rubber Aggregate

Challenge & Approach

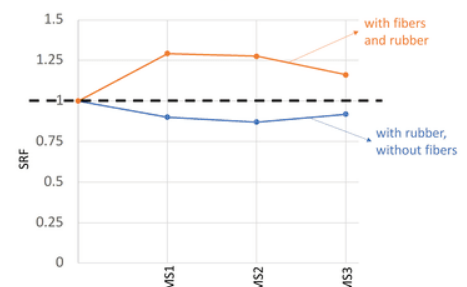
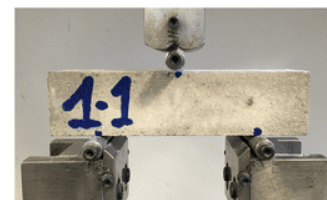
- The construction industry, and in particular concrete and cement-based mortars, are the first consumer of aggregate, at a point that sand and gravel are being extracted faster than they can be naturally replaced (Nature, 2019). If sand can be replaced by rubber from end-of-life tires, a remarkable loss of strength can be observed in concrete and mortars with respect to the absence of rubber.
- To compensate the loss of strength, especially in flexure/tension, fibers can be added to the cementitious matrix. Namely, to remain within the frame of circular economy, recycled carbon fibers can be added.
- Accordingly, flexural tests are performed on mortars containing rubber aggregate with and without the presence of carbon fibers.



Recycled Carbon Fibers

Results

- When 10% of siliceous sand is substituted by rubber, flexural strength decreases of about 10% (strength reduction factor SRF \cong 90%), in accordance with the decrement observed by other researchers (Gregori et al. 2019).
- On the contrary, the presence of recycled carbon fibers produces an increment of SRF, which can be larger than 1 even in the case of rubber concrete.
- As a compensation of flexural strength appears when recycled carbon fibers are added, the content of rubber can be maximized (with the same content of fibers) up to the value of SRF = 1.
- When a large volumes of rubber substitutes stone sand, density can decrease as well (lightweight mortar).



Impact for the Construction Sector

- Offer a solution for satisfying the green public procurements for different final users (large companies and single bricklayer).
- Increase the reuse of recycled materials in the construction industry of mortars.

Impact for an SME

Create a link between different waste stakeholders (i.e., tire recycler and carbon recycler) and the producers of dry mixtures.

Impact for a Sustainable Built Environment

- Contribute to raise the dry mix mortar production of about 2.5% yearly.
- Lower the use of virgin natural materials (such as stone aggregates) and fossil-based materials (such as fibers) in the production of dry mix mortars. In particular, carbon footprint can be reduced of about 10%.
- Also, the consumption of water and of the energy for the production, can be reduced of 1% and 2%, respectively.