SUPPORTED BY:

2nd International Summer School

ADDITIVELY MANUFACTURED CONCRETE STRUCTURES

Naples - July, 15-19, 2024

ACTIVE RHEOLOGY CONTROL OF CEMENT PASTES USING POTENTIALLY MAGNETIC PARTICLES FROM RESIDUAL MATERIALS

- INTRODUCTION AND MOTIVATION OF YOUR RESEARCH

- actively influence the rheological behavior of cementitious materials after the mixing process
- satisfy conflicting demands on cementitious materials during (automatic) fabrication processes (pumpability, buildability)
- targeted control of the rheological properties of fresh concrete to facilitate additive manufacturing and shorten production times in traditional manufacturing
- smart material behavior through excitation by means of an external stimulus (e.g. electromagnetism)

- MATERIALS AND METHODS

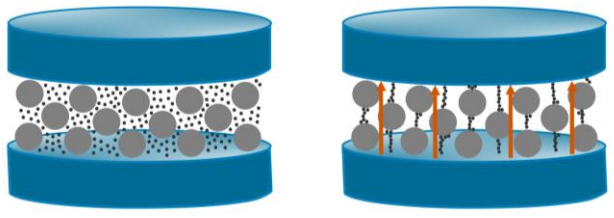
up to now: materials with magnetic properties

- nano-Fe_3O_4 powder
- carbonyl iron powder

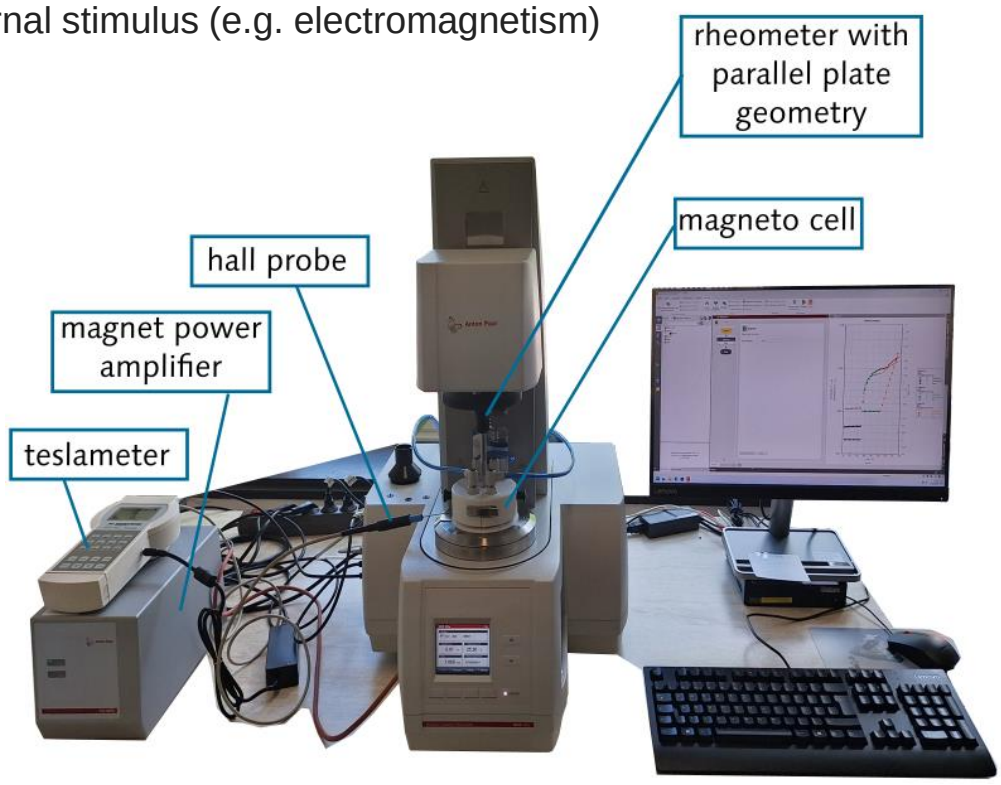
future: residual materials with potential magnetic properties

- domestic waste incineration ash
- sewage sludge ash
- electric arc furnace slag

PRINCIPLE – Magnetorheological fluids
introduction of ferromagnetic particles and excitation by an external magnetic field



without magnetic field | with magnetic field



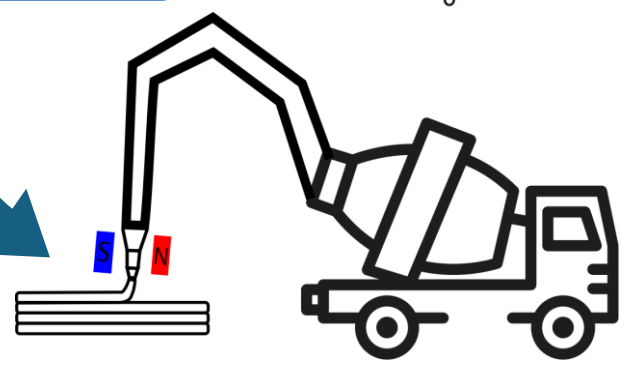
rheometer MCR102e, Anton Paar Germany GmbH

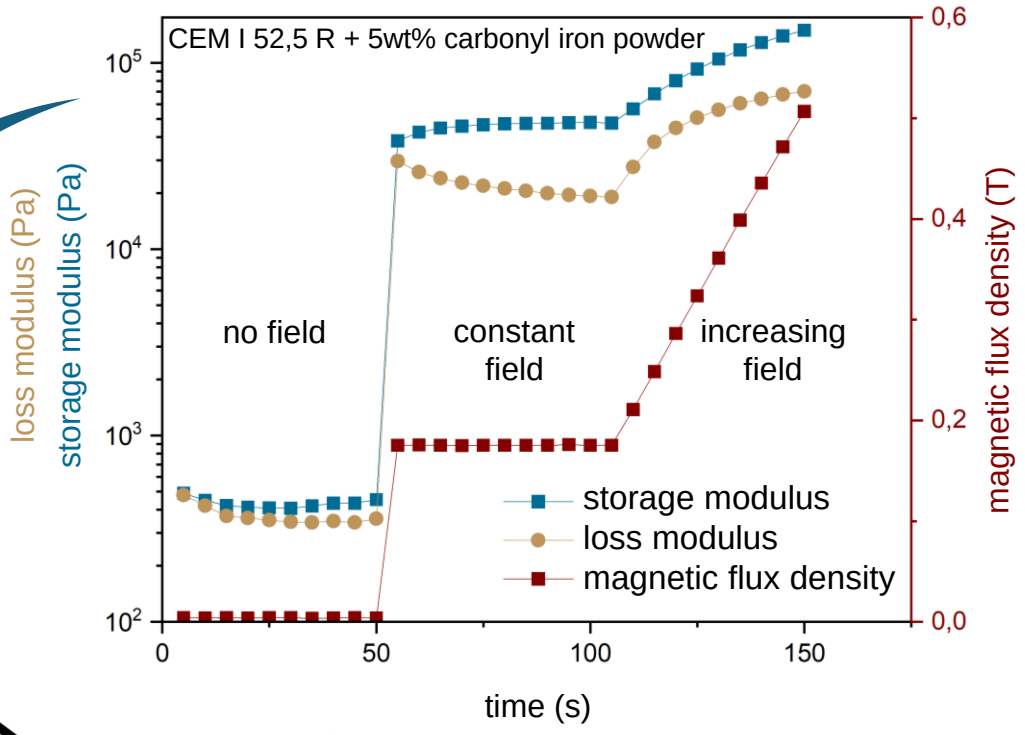
- RESULTS AND FUTURE PERSPECTIVES

- Rotational rheological measurements of cement pastes with magnetic particles demonstrate that stiffening can be induced by the application of magnetic fields.
- The response in terms of the storage and loss moduli depends on the magnetic strength curve (constant, linear).

Vision

Upscaling to scale of technical center and construction site





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