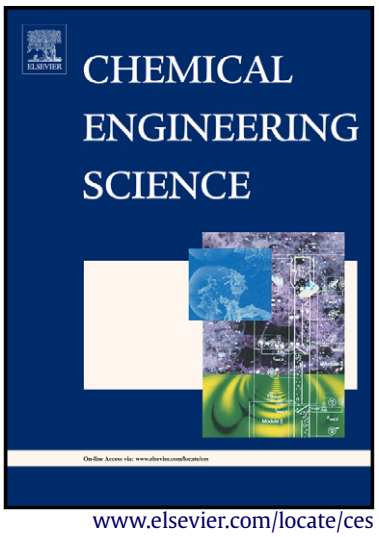

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Influence of binder and moisture content on the strength of zeolite 4A granules

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Abstract

Processing additives such as binders employed in granulation processes, often alter the mechanical properties of granules, significantly stiffening or softening them. However, on exposure to moisture, the effect of the inherent binders, are significantly altered due to their interaction with water. We present a comprehensive analysis of the material behavior and the strength of binderless and binder containing zeolithic molecular sieves in granular form.
The material behavior has been studied using single granule uniaxial compression tests until primary fracture at a constant loading velocity of v_B = 0.02 mm/s. The received force-displacement curves have been approximated using the Hertz model and the Tomas model for the non-linear elastic and the non-linear elastic-plastic regimes respectively.
The rate independent micro-mechanical properties and specific fracture characteristics are presented. The binder containing granules have a structure where the primary particles are embedded in a binder matrix. In contrast, the binderless granules are composed of primary particles mutually conjoined with each other. The strength of all products in the dry state are similar, however, on exposure to moisture, the strength of all granules slightly decreases.

1 Introduction

Ultrafine (d < 10 µm) to fine (d < 100 µm) cohesive solid powders are often granulated by spraying a liquid binder onto their surface or by mixing a solid binder with the powder to initiate agglomeration, forming larger semi-permanent aggregates called granules (d > 100