# Solar Active Plaster for the Renovation of Existing Buildings

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## Abstract

The building sector, especially considering existing buildings, requires an enormous part of a country's energy demand. In the course of the renovation of buildings, therefore, less emphasis is placed on the protection of the appearance of historical/older buildings than on their future energy consumption. This often leads to the fact that detailed characteristic facade features are not preserved since they are covered with insulation layers during the renovation process.
The development of a solar active plaster could be a solution in better agreement between conservation and energy efficiency. The solar active plaster should be able to add additional solar heat gains to the building walls energy balance and activate thermal storage masses. To fulfil those needs, the plaster has to be semitransparent. By improving the energy balance due to those solar gains, the insulation layer thickness can be reduced. The reduced thickness than allows geometrical details to be more easily preserved.
With the help of COMSOL Multiphysics® and the Heat Transfer Module in conjunction with the Ray Optics Module, a new type of plaster, consisting of hollow glass microspheres was investigated. To simulate this type of plaster, a method that is capable of generating hollow microspheres and distributing them in a predefined area was created in the Application Builder Tool. Subsequently, the influence of the solar radiation´s angle and the geometric properties of the hollow glass spheres on the transmission of solar radiation within the plaster were studied. For those observations, the raytracing principle within the Ray Optics Module was used. The work also shows the limitations and must have material characteristics to create an applicable solution of a solar active plaster for the renovation of existing buildings.