# PERFORMANCES OF HOLLOW CARBON SPHERES AS FLOATING BODIES FOR IMPROVED SOLAR EVAPORATION

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Hollow carbon spheres (HCSs) were produced from sugar alcohols encapsulated in photocurable polymer shells, which were submitted to a hydrothermal treatment in aqueous solutions of carbon precursors. Pyrolysis was then carried out at 900 or 1500°C, leading to HCSs. The hydrothermal treatment also allowed loading those HCSs with metals, either Fe or Ni. As a result, various HCSs were obtained, having different sizes, various residual oxygen contents, and based on more or less disordered carbon. Those containing metals were magnetic and graphitized.

When tested as floating bodies at the surface of salt water (mimicking seawater) for interfacial solar heating, these HCSs enhanced the solar water evaporation by up to 70% under a radiant power density of 1.3 kW/m$^2$. The performances depended on diameter, precursor, presence of metal, and pyrolysis temperature. It was conjectured that an optimum exists between a too high hydrophobicity, making the HCSs float far above the waterline, and a too high hydrophilicity, making them sink, and that the balance between these limits is a complex combination of contributions from apparent density, oxygen content, graphitic character, and wettability of HCSs.

All these properties were indeed accounted for by considering the floatability of the HCSs, measured as their fractional height above the water level. Modelling the water evaporation confirmed the major effect of floatability, the highest efficiency being obtained when full HCSs are below the water level but still in contact with the water surface, and the negligible effect of their thermal conductivity.

*Preferred participation: Oral presentation*