Cavitation nuclei in water exposed to transient pressures

A model of skin-stabilized interfacial cavitation nuclei and their response to tensile and compressive stressing is presented. The model is evaluated in relation to experimental tensile strength results for water at rest at the bottom of an open water-filled container at atmospheric pressure and room temperature. These results are obtained by recording the initial growth of cavities generated by a short tensile pulse applied to the bottom of the container. It is found that the cavitation nuclei shift their tensile strength depending on their pressure history. Static pressurization for an extended period of time prior to testing is known to increase the tensile strength of water, but little information is available on how it is affected by compression pulses of short duration. This is addressed by imposing compression pulses of approximately 1 ms duration and a peak intensity of a few bar prior to the tension pulse. The observations are interpreted on the basis of the new model.