

## **Growth inhibitors on carbonates**

### *Progress report*

Mineral scaling is one of the main problems for industries dealing with water treatment and processing. The presence of calcium carbonate in the aqueous media can lead, on the long term, to the clogging of pipes. Low production efficiency and high costs are the main consequences. In order to prevent this phenomenon, organic additives able to interact with calcium carbonate surface are used as growth inhibitors. In the recent years, the focus has moved from P-containing to new generation antiscalants: the so called "green antiscalants". These additives have interesting properties, like biodegradability, low aquatic and human toxicity, phosphorous and heavy metals-free. Poly aspartic acid, Poly Asp, belongs to this category and here studies are made to understand its effect during calcite formation and growth. Experiments with the "constant composition method" were carried out, both with poly Asp and its relative amino acid, in order to see if structure and geometry can play a role. Poly aspartic acid shows higher growth inhibition than Aspartic acid: smaller concentrations are required and higher inhibition % is reached. A comparison with a polymer of a defined length, Asp-Asp-Asp-Asp-Asp, was also made, as well as to the 5-units polymer of Glycine, the most simple amino acid. Different effects on calcite growth were observed, as well as their presence on calcite surface. Chain length, functional groups and their distance between each other seem to be the main factors affecting the interaction with the surface. Solid samples were collected and XPS analysis detects, for Aspartic acid polymers-containing samples, the presence of nitrogen on the first nanometers of the surface, indicating that the molecules are adsorbed. Morphology changes are also seen with SEM, mainly resulting in a general roughening of edges and in a stabilization of [100] faces.