

Form 2 – Nordic ChemQuest AB

Technology Information	
Areas	2, 3, and 4
Title	Concept for Enhanced Mass Transfer and Facilitated Handling of Adsorptive Processes
Submitted by	Nordic ChemQuest AB, Tvistevägen 48, S-90719 Umeå, Sweden
<p>1. Overview of Technologies (features, specification, functions, owners, etc.)</p> <p>SpinChem® is an innovative and unique concept for enhancement of mass transfer in reactions involving sorbents and solid phase reagents, encompassing several different ways of <i>using the stirring element itself</i> (the SpinChem unit) to establish a forced convective flow through a sorbent packing, located inside the body of the stirring element. We firmly believe that this technology could be used as an effective means of processing water and other liquids containing radionuclides, in a way that could make the processing both faster, safer, and above all, more flexible.</p> <p>The core of SpinChem® technology is deceptively simple; it consists of a cylindrical cavity with a drive shaft attached to the top cover, a central inlet in the bottom, and a multitude of screened outlets on the peripheral cylindrical surface. When this unit is rotated in a liquid, centrifugal force conveys liquid from the central inlet, through a sorbent that fills the internal cavity, and discharges it through the peripheral outlets. When operated, the rotary action creates a toroidal liquid flow below the unit flow in the liquid medium being processed, which leads to the creation of a vortex towards the inlet at the bottom. The unit thus sucks liquid also from the depth of the liquid volume and discharges it in a radial manner at the surface. It is therefore suitable for processing both confined and non-confined volumes of liquids.</p> <p>Some of the unique features of the technology are as follows:</p> <ul style="list-style-type: none"> ▪ The sorbent being used for processing is contained <i>inside the stirring element</i>, which <i>by itself acts as a pump</i> to convey the processed liquid from a vortex created below its bottom through the encased sorbent bed. ▪ If necessary, the stirring element can initially draw a suspended sorbent from the liquid into the treatment chambers, where the material then stays during the processing and allows facile recovery. ▪ In lab/pilot scale, the system has been designed with compartments, which allows the use of up to four different sorbents in parallel. Compartmentalization into an arbitrary number of chambers can be implemented in larger scale. ▪ After ended processing, excess liquid inside the stirring element is easily removed by centrifugal force, which can be followed by washing steps before discharging the sorbent containing the contaminants for disposal. ▪ As an alternative to disposing off the contained sorbent, the unit can be used for continued processing aimed, <i>e. g.</i>, at desorption and/or enrichment of trapped material without discharging the sorbent or dismantling the unit. ▪ Designs are already available that would make it possible to deploy mobile units in tanks and cisterns. ▪ Other designs are available that can be implemented on rafts, which enables treatment of non-confined water masses, such as ponds, streams, and basins, where the simultaneous combination of an inherent vertical pumping action with efficient trapping makes removal of contaminants efficient. ▪ We further envision a possibility of implementing the SpinChem concept in a “simulated moving bed” configuration, where sorbent-containing units can be shifted upstream in vessels of increasing contaminant concentration. ▪ Owner of the SpinChem technology is Nordic ChemQuest AB. ▪ The function is best described by animations and videos available on-line at http://www.spinchem.com 	
<p>2. Notes (Please provide cases of application, not limited to nuclear industry, time line for application)</p> <p>Concerning the technology readiness level, Nordic ChemQuest is already supplying SpinChem technology commercially to the laboratory and pilot scale markets, where successful tests have been made in reactors of up to 800 liter. Tests are presently being conducted on the 4 m³ scale with a prototype raft unit, with intended use for mobile clean-up of mine run-off water and other large scale hydrometallurgical applications.</p> <p>A recently filed patent application (which can be made accessible pending a signed non-disclosure agreement) further demonstrates that dedicated SpinChem reactors can either be configured to pump and process (both actions being accomplished by the device) in a side stream of a batch reactor, or set up to quantitatively treat a continuous flow in an efficient manner. The optimal utilization of a scaled-up version of the SpinChem device is probably <i>in situ</i> treatment of entire cisterns, reactor containments, or even harbor basins.</p> <p>The CTO of this project (Prof. Knut Irgum) will be in Tokyo on November 25-28 in other business, and will be delighted to discuss possible development of this technique for radionuclide clean-up in co-operation with TEPCO and possibly other Japanese industrial actors, who could assist in manufacturing large scale devices according to this principle. Under a signed non-disclosure agreement we could disclose details of on-going development, which are not possible in this public proposal. As a relatively small start-up company we see this not as a way of generating colossal sales or royalty revenues, but rather an application where we could be of benefit to the Japanese society, who at the end of the day will have to pay the entire bill for the aftermaths of the 2011 tsunami disaster.</p> <p>Patent reference: WO 2011/098570 and several non-published patent applications.</p> <p>SpinChem® is a registered trade mark of Nordic ChemQuest AB.</p>	