

# Total risk matrix regarding dangers for humans for Spinner/Spin Coaters

<b>Very Serious (E)</b>	<b>3</b>				
<b>Serious (D)</b>		<b>4, 5</b>			
<b>Moderate (C)</b>			<b>1</b>		
<b>Small (B)</b>					
<b>Very small (A)</b>		<b>2</b>			
<b>Cons. ↑ Propab. →</b>	<b>Very small (1)</b>	<b>Small (2)</b>	<b>Average (3)</b>	<b>High (4)</b>	<b>Very high (5)</b>

The colours show areas with evaluated risks which are acceptable (green), considerable, measures should be taken (yellow) and not acceptable, measures MUST be taken to reduce the risk (red).

## Description of Consequences

<b>A =&gt; Very small</b>	<b>Security / immediate damage to people</b> => damage which requires first aid only	<b>environmental consequences</b> => insignificant damage and short restitution time
<b>B =&gt; Small</b>	=> damage which requires professional medical attention	=> less damage and short restitution time
<b>C =&gt; Moderate</b>	=> serious damage /illness	=> less damage but long restitution time
<b>D =&gt; Serious</b>	=> Serious damage/illness with possible inability to work	=> long lasting damage with long restitution time
<b>E =&gt; Very serious</b>	=> Death	=> long lasting and not reversible damage

## Description of Propability

<b>1 =&gt; Very small</b>	=> Ca. one incident in 50 years or less often
<b>2 =&gt; Small</b>	=> Ca. one incident in 10 years or less often
<b>3 =&gt; Average</b>	=> Ca. one incident per year or less often
<b>4 =&gt; High</b>	=> Ca. one incident per month or less often
<b>5 =&gt; Very High</b>	=> weekly

# Risk evaluation of Spinner/Spin Coaters

Participants during risk evaluation (+function): Søren Heinze (Chief engineer), Trine Østlyng, Ida Noddeland and Espen Rogstad (as instrument responsible)

The responsibility for all described risks lies at the NTNU NanoLab leader and this document is approved by him or her:

							Consequences (A-E)	
ID	Activity/Name	Description (involved dangers and consequences)	Law, regulation	Existing safety measures	Existing documentation and other comments	Probability (1-5)	Humans (A-E)	Environment (A-E)
1	Splashing liquids during the opening of the chamber may harm the eyes	Since chemicals will be distributed all over the inside of the instrument some drops may splash while opening the chamber of the instrument. Also some spinners have a small opening in the chamber-lid where chemicals could splash out or this lid could accidentally open. This may harm the eyes or skin		=> during the course users are made aware that they have to wear glasses during operation of the machine => the use of gloves is mandatory in the whole laboratory => during operation this danger is non existent since the process chamber must always be closed => all users MUST clean the instrument according to the cleaning procedures in respect to the used chemical after their process is finished => it is not allowed to open the chamber while the wafer-table inside is still rotating => all spinners are controlled regularly by the instrument responsible regarding faults of the closing mechanism	course  => all users who want to use this instrument must make together with the responsible engineer a separate evaluation of the risks involved within the activity with special focus on the chemicals that will be used	<b>3</b>	<b>C</b>	<b>A</b>
2	Danger to squeeze body parts	If body parts are touching moveable parts while these are moving a user might squeeze e.g. a finger. The same is valid if a user is not carefull while closing the chamber of the instrument		=> during the course users are made aware not to touch moving parts of the instrument and to close the instrument carefully	course	<b>2</b>	<b>A</b>	--

3	Potentially dangerous voltages	Potentially dangerous electrical currents, might be present inside parts of the machine while power is connected to it. This could cause an electric shock if a cover is removed from the unit and internal parts are touched Attention: Capacitors might keep high voltage for some minutes after the power is unplugged	Law regarding service at and work with electrical constructions and equipment	'=> users are not allowed to remove covers from the instrument or parts of it => parts of the machine must just be opened to replace the lamp => such work will just be done by properly trained engineers => the instrument will be disconnected from power and the person who will do the work have to wait some minutes prior work that requires the removal of covers	Course and manual	<b>1</b>	<b>E</b>	--
4	Use of chemicals, resulting in dangerous fumes (toxic, explosive, corrosive)	Each spinner is configured to use specific chemicals for its processes. The use of not compatible chemicals might damage the instrument, increasing the risks named under points 1-3. Additionally if materials mix in the process chamber or in the waste streams, a hazardous and/or toxic chemical reaction may occur which might also result in dangerous fumes.	Chemical laws	=> The use of incompatible materials in the spinner is not allowed. => The spinner is placed in a fume hood => Before any new chemical is used in the spinner, the compatibility of the material with other chemicals in the system and the structural materials will be investigated by the responsible engineer.	Course manual  => all users who want to use this instrument must make together with the responsible engineer a separate evaluation of the risks involved within the activity with special focus on the chemicals that will be used	<b>2</b>	<b>D</b>	<b>D</b>

5	Use of dangerous chemicals	All risks involved with the use of certain chemicals apply for this point		<p>=&gt; the risks involved regarding dangerous chemicals must be separately and case dependend evaluated in the risk evaluation of each activity</p> <p>=&gt; all users MUST clean the instrument according to the cleaning procedures in respect to the used chemical after their process is finished to prevent unwanted reactions between different chemicals of different users</p>	<p>Course and activity dependend risk evaluation</p> <p>=&gt; in this risk evaluation for the instrument the risks involved with the use of certain chemicals can't be evaluated</p> <p>=&gt; in general the instrument is designed in a way to operate in a safe mode even if potentially dangerous chemicals are used if these are handled properly</p> <p>=&gt; the values for probability and consequences are made with respect to the above said</p>	2	D	D
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