Molten salt in water

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Molten salt is salt which is solid at standard temperature and pressure but liquified due to elevated temperature. A salt that is liquid even at standard temperature and pressure is usually called a room-temperature ionic liquid, and molten salts are technically a class of ionic liquids.

The explosion of alkali metals in water share some properties with molten salt explosions, specifically: it is extremely fast and violent - much faster than expected; a similar set of alternate explanations (steam pressure, hydrogen combustion) have been attempted but have not been shown to work

For more than a month in total, 12 metric tons of molten salt coursed through pipes at Kairos Power in Albuquerque, New Mexico. The company is developing a new type of nuclear reactor that will...

The primary uses of molten salt in energy technologies are in power production and energy storage. Salts remain a single-phase liquid even at very high temperatures and atmospheric pressure, which makes molten salt well-suited to advanced energy technologies, such as molten salt reactors, or hybrid energy systems.

The U.S. Department of Energy Advanced Reactor Technology Program"s Molten Salt Reactor (MSR) campaign is developing state-of-the-art thermochemical and thermophysical properties databases to aid in the design and licensing of new MSRs. This report provides a progress update on the development of the molten salt thermophysical properties ...

According to one amateur video in , the molten salt explodes when it is poured into water (c. 2:15)

What is the exact cause of the explosion?

Also, the author fails to explain why no explosion occurs with sodium tetraborate nor sodium carbonate when each of them, in molten state, was poured into the water.

Understand that sodium chloride is not made up of sodium metal and chlorine gas but of sodium ions and chloride ions, held together by ionic interactions. Under these thermal conditions (liquefication), the compound will not decompose into its elements and therefore all reactions you suggested which include elemental chlorine or sodium cannot occur.

Dissolution of sodium chloride in water is neither strongly exothermic nor strongly endothermic, so any effects stemming from the dissolution are neglegible.

Also note that you neglected an important variable in your calculations. As far as I can tell, you only calculate how to arrive at melting-point hot solid sodium chloride. To liquefy, additional melting enthalpy has to be

applied, a further reservoir of energy to draw from. This melting enthalpy is of course released upon rapid crystallisation, but you should really subsume it into the heat energy difference altogether.

I suspect rather strongly that this is a coulombic explosion.