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In this experiment, our primary chemicals include TiB_2, CTAB (Cetyl Trimethyl Ammonium Bromide) and H_2O_2 (Hydrogen Peroxide), where we expect reaction-like happening between TiB_2 and H_2O_2 thus forming TiB_2 seeds which in the presence of CTAB can result in TiB_2 nanorods. For this experiment, we have to analyze the possible unexpected reaction like between CTAB and H_2O_2.

H_2O_2, if required to react with CTAB, first needs to degrade to hydroxyl radicals. Only at certain conditions, such transformation to hydroxy radicals' process occurs. If the temperature of Hydrogen Peroxide increased to 280^{o}C, it may result in the formation of oxygen and water. The possible chances are that oxygen may result in unexpected reaction with CTAB or even TiB_2. But luckily, our experiment is working on Room Temperature.

For pH of the solution to be around 7, without the help of UV, if Hydrogen Peroxide was mixed with CTAB and kept in the darkroom, it was noticed that no significant degradation rate of CTAB was observed, given the fact that no hydroxyl radical was formed. To further analyze, if the molar ratio between Hydrogen Peroxide and CTAB was increased and varied, yet there was no significant improvement in the CTAB degradation rate. The above statements make us conclude that for pH around seven if powerful light with low wavelength is not present, we can rest assured that CTAB will never react with Hydrogen Peroxide for any concentration of CTAB or Hydrogen Peroxide.

It becomes necessary to know at what conditions, the reaction may take place. For solution having pH being seven at UV of 253.7nm, CTAB is degraded nearly 55% within a few hours. But, if the molar ratio between H_2O_2 and CTAB is 2, and instead of UV we use advanced oxidation method, CTAB is degraded 100% within a few minutes. To understand the role of mols in this degradation process of CTAB in the advanced oxidation method, the concentration of CTAB and Hydrogen Peroxide was varied. Facts suggest that with increasing the mols of Hydrogen Peroxide after a certain amount do not result in fast degradation of CTAB. Neither, the increment of CTAB concentration will result in more rapid deterioration of CTAB.

To further analyze the degradation process of CTAB, the pH of the solution was also varied. Hydrogen Peroxide becomes unstable in the pH between 1-7, due to its reaction with the acidic proton. So, the available pH range becomes 7-12. Here, pH range between 7-10 results in n significant change in the degradation in CTAB. But pH from 10-12 proves to decrement the rate of degradation of CTAB.

Though we understand that, CTAB won't react with Hydrogen Peroxide, for our experiment setup, it becomes necessary to understand the reaction conditions between them, thus to avoid any accidents in future. CTAB is considered hazardous to the environment, and for a higher scaled experiment, we may require vast quantities of CTAB. Thus, disposing CTAB may become problematic. Fortunately, we know that Hydrogen Peroxide at certain conditions reacts with CTAB and can degrade it.

By this, we understand that CTAB won't react with Hydrogen Peroxide and degradation of CTAB can be achieved with the available chemical constituents itself.

References:

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