



AN ELECTROLYSIS ASSISTED ATOMIZATION PROCESS IITM Technology Available for Licensing

Problem Statement

- The transformation of assisted bulk liquid into sprays & other physical dispersions in a gaseous atmosphere has penetrated almost every industry and household.
- Dissolved gas atomization involves dissolved gas coming out of the solution to form bubbles. Injecting even small quantities of gas at supercritical temperatures showed significant effect. However, several problems such as **dissolution of gas in the liquid & low bubble growth rate limited** the practical application of such systems including other issues.
- Hence, there is a need to address the problems in efficient manner.

Technology Category/ Market

Technology: Electrolysis assisted atomization process;

Industry & Application: spray combustion in furnaces, gas turbines, diesel engines, rockets & etc.

Market: The global industrial atomizer market is projected to grow at a **CAGR of 6%** during the forecast period **(2024-31)**.

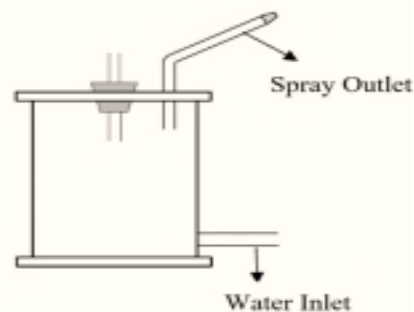
Technology

- Present patent describes a **process for atomization of liquid and sprays in an electrolysis assisted atomization**.
- The instant invention uses the principle of **electrolysis** to **produce gas** required for effervescent atomization.
- This **process** involves **effervescent assistance** and **associated electrolysis assistance** for **breaking the liquid surface into droplets**.
- The electrolysis process produces gases in the form of tiny bubbles that participate in the atomization process as the effervescent medium.

- The atomization process of a liquid comprises the steps of

- (i) **effervescent assistance step** that comprises of **using liquid** to be atomized itself as an electrolysis solution contained in an atomizer chamber to form a **bubbly two-phase** as a source of **effervescent gas**; and
- (ii) **associated** electrolysis assistance step, for **breaking the liquid surface into droplets**, characterized in not using external effervescent gas source, and the electrolysis assistance step also comprises of partitioning the said atomizer chamber into a flow portion and a bubble generation portion.

Fig.1 shows claimed atomization device;



Intellectual Property

IITM IDF Ref. 956; IN Patent No. 372416

TRL (Technology Readiness Level)

TRL-4, Proof of Concept ready, tested and validated in Laboratory

Research Lab

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Images

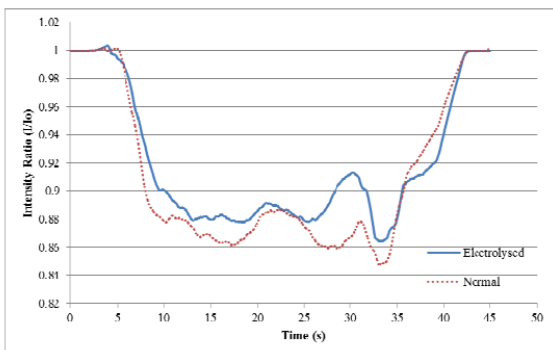


Fig. 2 shows intensity ratio-4bar pressure axial distance 40mm-current 2A;

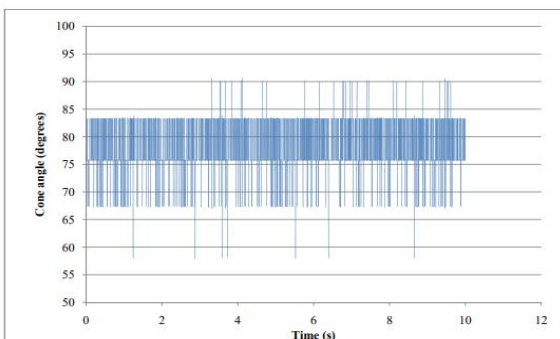


Fig. 3 shows cone angle variation-4bar

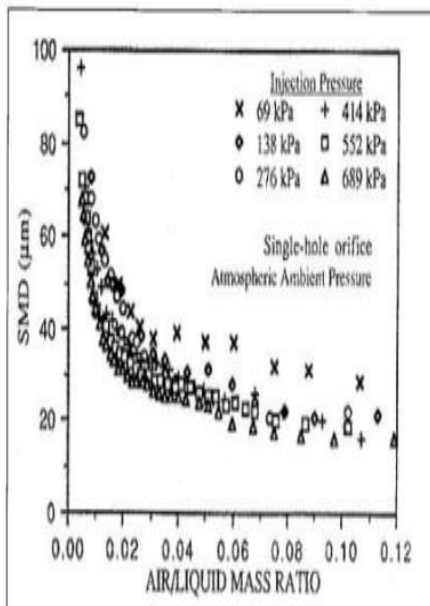


Fig. 4: depicts Variation of spray SMD with injection pressure and GLR [6];

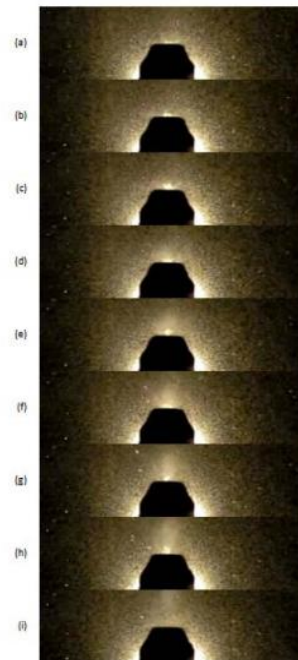


Fig. 5 shows High speed sequential images at 1200 fps showing bubble explosion;

Key Features / Value Proposition

- **Good atomization** can be achieved at **lower injection pressures** significantly lower than other atomizers.
- **Smaller drop sizes** are produced at any given pressure as compared to other methods.
- **Gas flow rates** required are **less** than those of **twin fluid atomizers**.
- There is an **enhancement in performance** of the **effervescent atomizers** with **large size orifices** which **alleviate problems of clogging & maintenance**.
- The electrolysis process is **advantageous to produce gases** in the form of **tiny bubbles** that participate in the **atomization process** as the **effervescent medium**.
- A spray, **highly atomized** would have **greater droplet density** resulting in **lower intensity ratios**.

Utility:

- **Atomizers & sprays** range from combustion – **spray combustion** in furnaces, gas turbines, diesel engines & rockets;
- **Process Industries** – spray drying evaporative cooling, powdered metallurgy, spray painting;
- **Agriculture** – crop spraying; and
- Other applications in **medicine & meteorology**.

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