

# **Electromagnetic methods for production of aluminium metal matrix composites**

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Aluminium metal matrix composites (MMC) are perspective materials for wide range applications in automotive, aerospace and other industries where material mechanical properties and weight ratio is crucial. MMC manufacturing through metallurgical route two challenging tasks can be set – firstly, reinforcement introduction into the melt and secondly, particle agglomerate dispersion. For the first task typical obstacle is poor particle wettability, while in second task particles added to a liquid metal tend to form agglomerates due to van der Waals and interfacial forces. Most of currently used manufacturing methods through metallurgical route are effective only for small quantities or are time consuming, so new MMC manufacturing methods are still needed.

By using electromagnetic field, it is possible to induce liquid metal flows in contactless manner. It has been shown that travelling magnetic field generated by permanent magnet dipole induce intense liquid metal flows in the melt even through thick crucible walls. Depending on the application the flow can be adjusted by changing the rotating dipole size, position, and rotation frequency. This research focusses on application to use such stirrer as an alternative to mechanical stirrer in stir casting MMC production process.

Combined AC and DC magnetic fields creates oscillating electromagnetic force which may induce cavitation in liquid metals. Cavitation bubble collapses are believed to be the mechanism of particle agglomerate braking and particle dispersion in metal. For some alloy and particle pairs the results are promising and further development process of the method is in progress.